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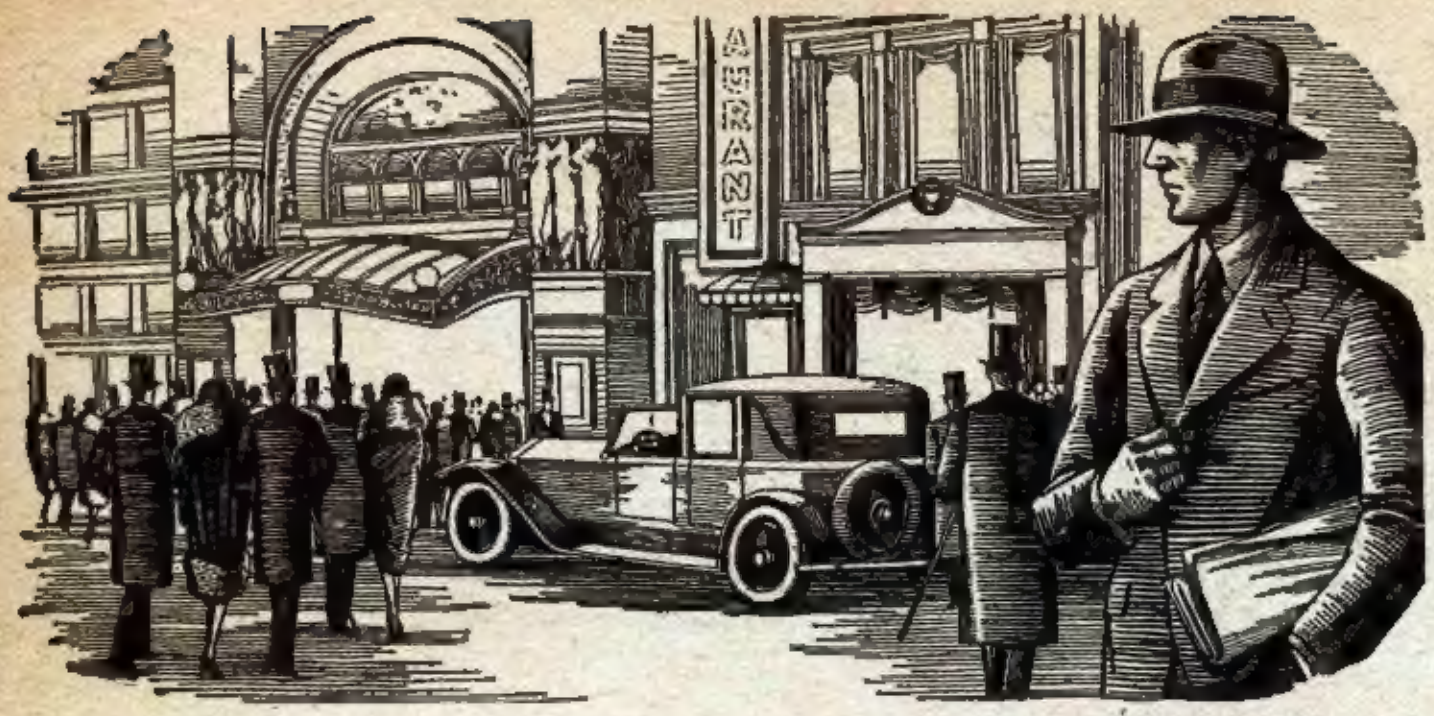

Always outside of things—that's where I was just twelve short months ago. I just didn't have the cash, that was all. No theatres, no parties, no good restaurants. No real enjoyment of life. I was just getting by, just existing. What a difference today! I drive my own car, have a good bank account, enjoy all the amusements I please.

I Couldn't Get the Good Things of Life

Then I Quit My Job and "Found" Myself!

HOW does a man go about making more money? If I asked myself that question once, I asked it a hundred times! I know the answer now—you bet. I know the way good money is made, and I'm making it. Gone forever are the days of cheap shoes, cheap clothes, walking home to save carfare, pinching pennies to make my salary last from one pay-day to the next one. I own one of the finest Radio stores you ever saw, and I get almost all the Radio service and repair work in town. The other Radio dealers send their hard jobs to me, so you can see how I stand in my line.

But—it's just a year ago that I was a poorly paid clerk. I was struggling along on a starvation salary until by accident my eyes were opened and I saw just what was the matter with me. Here's the story of just how it happened.

One of the big moments of my life had come. I had just popped the fatal question, and Louise said, "Yes!"

Louise wanted to go in and tell her father about it right away, so we did. He sort of grunted when we told him the news, and asked Louise to leave us alone. And, my heart began to sink as I looked at his face.

"So you and Louise have decided to get married," he said to me when we were alone. "Well, Bill, just listen to me. I've watched you often here at the house with Louise and I think you are a pretty good, upstanding young fellow. I knew your father and mother, and you've always had a good reputation here, too. But let me ask you just one question—how much money do you make?"

"Twenty-eight a week," I told him.

He didn't say a word—just wrote it down on a piece of paper.

"Have you any prospects of a better job or a good raise some time soon?" he asked.

"No, sir; I can't honestly say that I have," I admitted. "I'm looking for something better all the time, though."

"Looking, eh? How do you go about it?"

Well, that question stopped me.

How did I? I was willing to take a better job if I saw the chance all right, but I certainly had laid no plans to make such a job for myself. When he saw my confusion he grunted. "I thought so," he said. Then he held up some figures he'd been scribbling at.

"I've just been figuring out your family budget, Bill, for a salary of twenty-eight a week. I've figured it several ways, so you can take your pick of the one you like best. Here's Budget No. 1: I figure you can afford a very small unfurnished apartment, make your payments on enough plain, inexpensive furniture to fix such an apartment up, pay your electricity, gas and water bills, buy just about one modest outfit of clothes for both of you once each year, and save three dollars a week for sickness, insurance, and emergencies. But you can't eat. And you'll have to go without amusements until you can get a good, substantial raise in salary."

I began to turn red as fire.

"That budget isn't so good after all," he said, glancing at me; "maybe Budget No. 2 will sound better——"

"That's enough, Mr. Sullivan," I said. "Have a heart. I can see things pretty clearly now; things I was kidding myself about before. Let me go home and think this over." And home I went, my mind in a whirl.

At home I turned the problem over and over in my mind. I'd popped the question at Louise on impulse without thinking it out. Everything Mr. Sullivan had said was gospel truth. I couldn't see anything to do, any way to turn. But I had to have more money.

I began to thumb the pages of a magazine which lay on the table beside me. Suddenly an advertisement seemed almost to leap out at my eyes, an advertisement telling of big opportunities for trained men to succeed in the great new Radio field. With the advertisement was a coupon offering a big free book full of information. I sent the coupon in, and in a few days received a handsome 64-page book, printed in two colors, telling all about the opportunities in the Radio field and how a man can prepare quickly and easily at home to take advantage of these opportunities. I read the book carefully, and when I finished it I made my decision.

What's happened in the twelve months since that day seems almost like a dream to me now. For ten of those twelve months I've had a Radio business of my own! At first, of course, I started it as a little proposition on the side, under the guidance of the National Radio Institute, the institution that gave me my Radio training. It wasn't long before I was getting so much to do in the Radio line that I quit my measly little clerical job and devoted my full time to my Radio business.

Since that time I've gone right on up, always under the watchful guidance of my friends at the National Radio Institute. They would have given me just as much help, too, if I had wanted to follow some other line of Radio besides building my own retail business, such as broadcasting, manufacturing, experimenting, sea operating, or any one of the score of lines they prepare you for. And to think that until that day I sent for their eye-opening book, I'd been wailing, "I never had a chance!"

Now I'm making real money. Louise and I have been married six months, and there wasn't any kidding about budgets by Mr. Sullivan when we stepped off, either. I'll bet that today I make more money than the old boy himself.

Here's a real tip. You may not be as bad off as I was. But, think it over—are you satisfied? Are you making enough money, at work that you like? Would you sign a contract to stay where you are now for the next ten years, making the same money? If not, you'd better be doing something about it instead of drifting.

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this month, taken from "Trapped in the Depths," we see our undersea voyagers faced with a new danger, from the great sea beast. But the beast is due for a great surprise, for the "ticklers" that extend around the submarine have been provided for just such moments as these.

NEXT MONTH

THE TIME VALVE, by Miles J. Breuer, M.D. We offer now to our readers the marvelous sequel to Dr. Breuer's "Fitzgerald Contraction." A flight of 200,000 years into the future may seem to us unimaginable, but our author accomplishes it in a vivid and realistic manner. And although he is not a pessimist, Dr. Breuer foresees a human race which is a sad degeneration from our present state of civilization. This is a most thrilling story and one of our well-known author's best.

THE WAR OF THE GREAT ANTS, by Jim Vanny. We humans give our small neighbors, the ants, credit for too little intelligence. Ants are really very clever creatures, and it is possible that they might, as our author pictures, be able to build up great cities, and make slaves of animals that at the present time despise them. Suppose ants could make slaves of us, and have us do their work? As our readers can realize, this is a most intriguing idea and Jim Vanny works it out in a corking adventure story.

A SUBTERRANEAN ADVENTURE, by George Paul Bauer. This story is approaching its most thrilling phases. Our author has an astounding imagination in his ability to picture totally strange worlds beneath the earth's surface. And in the incidents of this story there is both humor and tragedy in the attempts of our poor explorers to get out of the clutches of the Inner People. Don't miss this installment.

THE BAT-MEN OF MARS, by Wood Jackson. This aviation-interplanetarian story comes now to its startling and dramatic climax. Overhanging our interplanetary travelers is the superstition of the Martians regarding a strange prophecy. But in the crater of Dir, where the Bat-Men live, lies the basis for sudden and overwhelming disaster. Can it be avoided; will the earthlings help the Martians? Be sure to finish this stirring story of two worlds.

AND OTHERS.

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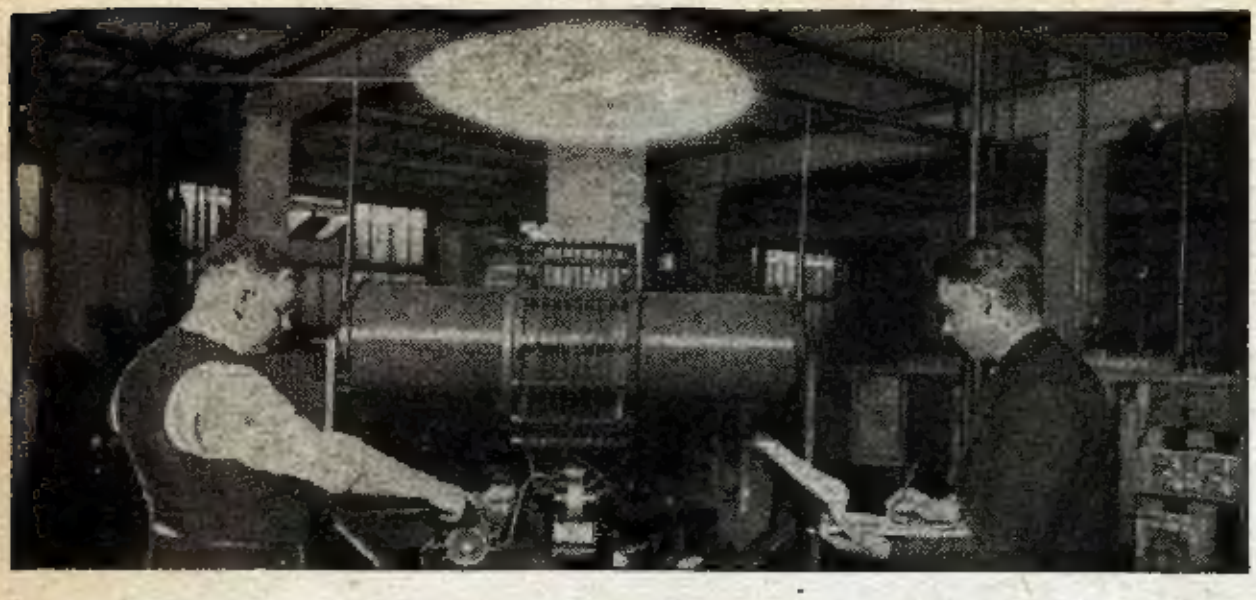

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These nationally-known educators pass upon the scientific principles of all stories.

THE WONDERS OF SLEEP

By HUGO GERNSBACK

ONE of the unexplored mysteries of the animal mechanism is the phenomenon known as sleep. It is, indeed, one of the greatest unexplored spheres of human knowledge. It is also rather strange that there is a dearth of literature on the subject, and that only of late have our psychological laboratories in the various universities taken up the subject from a strictly scientific standpoint.

There are various theories as to the causation of sleep. Some authorities believed that sleep is induced by the gradual accumulation of poisons in the system—that it is a form of auto-intoxication which benumbs our brains. Though a plausible theory, this, however, has been disproved by scientists.

Another theory is that the brain simply tires, as muscles become fatigued; and upon its relaxing there ensues a suspension of its activity; which is thus supposed to produce the condition of sleep.

Some years ago I tabulated a list of various forms of sleep, which may be classified roughly as follows:

First, natural sleep; second, hypnotic sleep (it is of interest to note that sleep of this particular class distinguishes itself from the others, in that the subject may sleep with the eyes open); third, sleep produced by blows or by fainting, called unconsciousness; fourth, narcotic sleep, as produced by means of drugs; fifth, hibernating sleep (found in many animals such as bears, etc.) which, in all probability, is nothing but hynotic sleep.

As yet we have, from a scientific standpoint, only the slightest idea of the mechanics of sleep; and it may take many hundreds of years before we understand the entire processes which take place when the mind goes to sleep. The problem is far more complicated than it is usually believed to be.

Contrary to the usual belief, sleep does not suspend the workings of our various faculties. Even though we are asleep, we still hear, we still smell, we still feel, we can still taste and we can still see; although, usually, in the latter case only through the mind's eye.

In other words, even while we sleep, all of our faculties (with the possible exception of sight) remain alert. A slight touch will awaken us; an unusual sound, which need not be loud (as, for instance, that produced by mice nibbling), will awaken us; an unusual odor, such as that of burning material, will also awaken us. All of this shows how complicated sleep really is.

To prove this contention, many years ago I invented an apparatus which I termed the "*Hypnobioscope;*" by which I undertook to prove that the sub-conscious mind never sleeps at all. This system, by the way, is being used by the United States Government at the Pensacola, Fla., naval training station; by this means students who have been backward in learning the Morse code are instructed in the code while they sleep, in the following manner. At the Pensacola station one will see them sleeping on their cots with helmets, resembling an aviator's, over their heads; the inside of each helmet is fitted with regulation telephone receivers. Code is sent to them all night long, while they sleep; and it has been found that, in the sleeping condition, students learn the code who could never do so while awake. The answer is that, while the student sleeps, his sub-conscious mind is wide awake and there is nothing to distract it, as during waking hours. Consequently, the impression received on the auditory nerves through the telephone receivers is more effective in this manner. After the students have become used to the system, the sounds produced in the telephone receivers do not awaken them; and instruction continues at a rapid pace.

An interesting point for psychologists to note here is that, if an "SOS" is sounded by code, the students all wake up instantly; again proving that the sub-conscious self never sleeps but is actually wide awake.

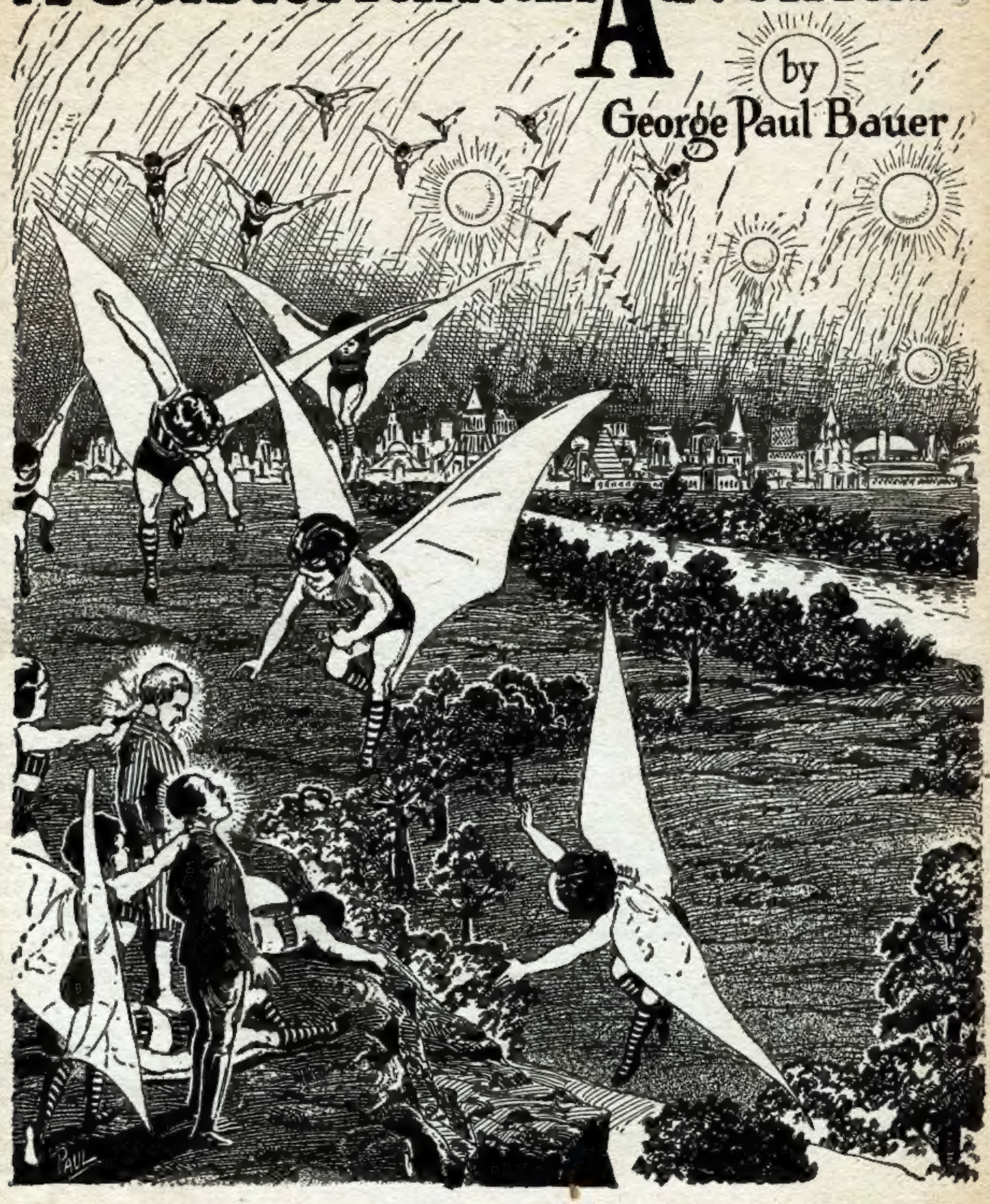
How much sleep does a human system need? From prehistoric times, most animals and human beings have gone to sleep at sundown and awakened at sunrise. This is probably one of the real reasons for the habit of sleep.

Recently in experiments made at Colgate University upon a number of students, it was found that, for all practical purposes, four hours of sleep seemed to be sufficient in most cases. Even one hour of sleep was enough in many cases to give real rest, providing the subject could catch a few more hours of sleep at a later time, and thus make up the loss.

With electric light and artificial illumination, it seems certain that humanity may, during the next ten thousand years, gradually free itself from excessive need of sleep and probably learn to get along with three or four hours' repose, instead of the present seven or eight.

A Subterranean Adventure

by George Paul Bauer



(Illustration by Paul)

Then something icy cold touched the back of my neck; and suddenly every vestige of strength seemed to be withdrawn from my body, leaving it numb and lifeless.

STOP, Denniston!—For heaven's sake, stop! There's somebody lying on the road ahead—just where it turns!"

With a screeching of protesting brakes, and the dull grinding of rubber against stone, the large touring-car came to a sudden, sliding halt, in perilous proximity to the outer edge of the narrow mountain road; and its occupants, a party of four young men in hunting togs, piled out hurriedly. By the light of dawn they gathered about the still figure of a man, lying on his face in the dust.

Evidently the unfortunate fellow had been the victim of an atrocious assault, for the uncovered part of his strong body was a mass of bruises, half-healed welts and criss-cross cuts such as viciously applied whip-lashes would leave; the ends of his fingers were raw and covered with congealed blood, the nails of several being completely torn off.

He appeared to be dead; for his body was quite cold to the touch. But the coldness might have been due in part to the icy mountain air, against which his meager costume furnished inadequate protection. He was dressed in nothing but two wide belts of violet-colored leather, laced in front, one about his chest and one about his loins, to the latter of which a pair of very short pants, like athletic trunks, was attached. There were very heavy metallic clasps riveted into the back of each belt, the purpose of which was not apparent.

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"Poor devil!" one of the hunters commented, pityingly. "I wonder what, in the name of wonders, he was doing in this icy, uninhabited wilderness, dressed like that? And look at those queer, laced boots he is wearing: The way they're cut up, he must have been traveling many miles over sharp rocks."

"Looks to me like some kind of circus performer in that rig," another of the party remarked thoughtfully. "Chances are somebody had it in for him, kidnapped him from the show, brought him out here somewhere, beat him up and dumped him. The work of a gang, I'd say. What do you think, Denniston?"

Frederick Denniston, a journalist, the owner of the automobile, was down on his knees, carefully examining the unconscious man in his quick and efficient manner. He gave a sudden exclamation. "Why, he's still alive! Here, give me a hand, some of you fellows! There's only one thing to do, take him back to Denver to a hospital as quick as we can. I know none of you will mind if we postpone our trip until tomorrow."

There was an instant and unanimous assent to this. And a few minutes later they had wrapped the unfortunate man in blankets and coats, and were traveling back to the capital city of Colorado in all haste.

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"He's been badly manhandled, and has been through an extraordinary amount of over-exertion and exposure," the hospital surgeon diagnosed. "But with his build and constitution he'll be O.K. inside of ten days."

This was good news to the hunters, and before they left the hospital they had jointly arranged that their unknown charge was to have the best care that money could buy.

It was quite natural, of course, that when, about a week later, the four men returned from their successful hunting trip, they should motor at once to the hospital.

"He's almost as good as new," the doctor answered to their eager inquiries. "All he needs now is plenty of good food, and air and sunshine somewhere out in the country."

Denniston beamed delightedly.

"And I've got the very place for him—my bachelor home, three miles out of town. He can get all the fresh air and sunshine he wants, and Mrs. Hall, my housekeeper, is the best cook in Denver."

The surgeon nodded approvingly.

"Fine! And perhaps you'll have better luck than any of us at the hospital in finding out his identity, and just what had been happening to him previous to your discovery of him. Beyond stating that he is an American, and that his name is Ned Gothram, he has been about as communicative as my pet skeleton. The fellow is a mystery, if ever there was one. I'd give a lot to hear his story."

OUR readers are probably all acquainted with that masterpiece of science fiction "Below the Infra-Red." Now we offer our readers a further delight from this author, in the present story.

Mr. Bauer himself calls the present story his best work, and the editors after reading the story can heartily agree with him.

Here we have a swiftly moving tale of the adventures of two intrepid explorers into the unknown dangers of the earth's interior. They had hoped to drive a tunnel clear through the earth, but instead they came upon something so remarkable and experienced such mysterious things that even to the teller of the story, they escape belief.

Mr. Bauer as the narrator of tales of strange places and strange events has few equals. And though, to the unthinking person, the present story may be unbelievable, yet by the magic of words, Mr. Bauer convinces us against our own will.

An Unparalleled Undertaking

THE stag dinner at Frederick Denniston's bachelor home in honor of his convalescent guest, Ned Gothram, was a perfect success. Besides the host and Gothram only three others, the hunting companions of Denniston, had been invited, and all of them

had thoroughly enjoyed the excellent viands provided by Mrs. Hall, the journalist's treasured housekeeper and cook. At the end of the meal the host rose to his feet, and proposed a toast to the health of his convalescent guest, which his three friends enthusiastically seconded.

In answer to the toast, and amidst expectant silence, Ned Gothram rose to his full height of six feet and five inches, and faced them gravely. His sonorous voice was vibrant with feeling when he spoke.

"Gentlemen—friends," he began slowly, "I feel that any words of mine would be quite inadequate to express my appreciation of what you have done for me. I only hope that sometime in the future I shall be able to reciprocate, in a small measure a least, your wonderful help and kindness to me."

Denniston raised his hand in a deprecatory gesture.

"My dear fellow, what my friends here and I were privileged to do for you, you would have equally done in our place, I'm sure of that. So please don't mention it. And we don't want you to feel under the slightest obligation to us. We did only what was our plain duty."

There was a unanimous and emphatic assent from the others.

Gothram nodded, and his deep-lying, dark gray eyes shone out at them in warm friendliness and gratitude.

"That's the true Christian way of looking at it," he agreed. "But there's one thing which, I hope, you'll allow me to do—for I feel that it's your right to know—and that is, to tell you my story. It is, however, so utterly incredible and fantastic, that I doubt if any of you will believe a word of it!"

His glance passed from one to another, and he smiled sadly. In that moment it seemed to the others that the deep lines of suffering in his intellectual face were suddenly accentuated, and his strong mouth compressed, as if to prevent a sob from escaping.

"But, my dear fellow—" Denniston protested, "you are under no obligation to tell your story, you know, unless you especially want to. As a journalist and writer, I confess I'm intensely interested, and so are my friends here. But I'm also sure that none of us would think for a moment of prying into your private affairs."

Again there was a unanimous assent from Denniston's three friends.

Gothram's eyes thanked them. "I shall be only too glad to tell you my story," he said simply.

"In that case let's go to the den, and make ourselves comfortable," Denniston invited, and led the way.

When they were all established in various easy chairs, equipped with smoking material, and when the fire in the spacious fire-place began to crackle pleasantly with the addition of a new log, all eyes turned expectantly to Gothram. He sat hunched forward in his chair, staring at the fire, and his wide, bulging brow was corrugated with concentrated thought as he evidently arranged the details of his story in his mind. Then, without preamble, he began:

SOME time ago I conceived a wonderful idea! Listen, and learn into what utterly strange situations, fantastic adventures, and terrible misfortunes an idea may lead one!

To be brief, my unprecedented idea was the complete piercing of the Earth, a matter of some 7,925 miles, by means of a vertical shaft; thereby connecting the approximate geographical center of the United States with a point near its antipodes* in Asia, providing the most direct route of communication between the two continents.

It is scarcely necessary to point out what immense advantages such an intercontinental route would have over all surface routes, whether on the sea, or the land, or by air, if it could be made a reality. And it was this very thing that I proposed to do.

My idea was the result of an accidental discovery.

Ever since my college days I have been a dabbler in the sciences, especially in chemistry and electricity, and, being a man of independent means and a bachelor, I indulged in my hobby to the full. Thus it is perhaps not surprising that I followed the lead of many eminent scientists, and tried to find a means of disrupting the atom and liberating its immense energy.

I did not succeed in disrupting the atom. But one day I did make a monumental discovery.

To ease my mind from too much concentrated application to my atomic researches, I decided one day to play at haphazard experimenting, as I frequently did. There was a large block of granite in my laboratory, and I idly amused myself by alternately spraying this with various chemical mixtures and then concentrating upon the sprayed area a reflected stream of electric waves of a very high frequency.

Imagine my surprise, when suddenly the entire sprayed area, about six inches square, dissolved into a gray-colored gas, and rose to the very ceiling of the room!

The chemicals had soaked into the granite to a depth of a quarter of an inch, and every bit of the treated rock had disappeared cleanly, as if it had been chiselled out. Through mere chance I had stumbled upon a most remarkable discovery! I bored clean through the great block of granite in my laboratory inside of a few minutes, and vaporized pieces of flint and of quartzite, and other minerals I had found.

That night I was unable to go to sleep. I tried to realize just what my discovery was worth. I visualized the entire mining industry revolutionized. Tunneling would become mere child's play, without drilling and without dynamite. The hardest rocks could be evaporated with ease.

And then, from somewhere in the outer void, the idea came into my mind—an idea so gigantic that its possibilities staggered me.

At first I rejected it as a mere fantastic dream. But as time went on the thought gradually fascinated me more and more. I decided to keep my discovery of rock dissolution a secret, and to carry out my immense, unparalleled project.

Just about this time my orphan nephew, Teddy Cranston, came back from college. He was the son of one of my sisters, and since her death I had been his guardian. He had just obtained his diploma as mechanical en-

* On the directly opposite side of the earth.

gineer, and I knew that he would be an invaluable aid to me in building the machine I had in mind.

When I confided my idea and plans to him, he thought at first that I was joking. But when I finally convinced him that I was serious, he was wildly enthusiastic.

"Great Jupiter—what a whale of a project!" he exulted. "Let's get started right away, Uncle Ned." That was Teddy all over. Full to the tips with youthful strength and energy, and ready to go at a word.

Of course, we both realized fully that for such a prodigious undertaking it would be absolutely necessary for me to interest some of the most prominent capitalists in the country. And we likewise knew that, in order to interest capital, we had to show them something concrete and practical, or they would not consider the proposition for a moment. Therefore we proceeded to "show" them.

No sooner had we finished our drawings and blue prints, than I ordered material for the construction of the machine we had designed. When this arrived, I engaged a number of skilled and discreet machinists, and hired Teddy to boss them. Naturally we did not take the workingmen into our confidence, but since I paid them exceptionally well, they did not seem to mind the secrecy, thinking, no doubt, that Teddy and I were two invention cranks who must be humored.

The work progressed rapidly, and in a little over six months of intense labor the great machine was standing completed upon the very spot at which it was to descend into the mysterious interior of the Earth.

CHAPTER II

Into the Unknown

THE workmen had all departed, and Teddy and I stood before the huge machine we had built, viewing our handiwork with intense pride. I will not tire you with a description of mechanical details. Suffice it to say that the *Penetrator*—we had named it that—was formed like a great projectile. It was standing upright upon the heavy concrete floor where it had been built, and its height, from its flaring base to the tip of its oval-shaped head, was forty-five feet, its diameter being one-third of that.

In the massive base of the *Penetrator* the disintegrating apparatus was located, and its extreme upper point terminated in a short shaft, to which a large, three-bladed propeller was attached. This was driven by a high-speed electric motor, and was designed, during the process of penetration, to hurl to the surface the vaporized rock which escaped upward through perforations in the flared base. But the most peculiar part of the *Penetrator* was its climbing mechanism: a massive, square-sided ring of steel plate, surrounding the machine at about three-quarters of its height, and divided into four sectors by four gaps at right angles to each other, in each of which a great cog-wheel with eight massive teeth was located. As the *Penetrator* descended into the earth, four special disintegrating nozzles automatically formed holes in the sides of the shaft into which the teeth of the cog-wheels engaged.

Thus, by means of its eight electric motors, the climbing apparatus could raise the machine up or lower it, either automatically or by direct control. Of course, during penetration it worked automatically, lowering the *Penetrator* as fast as the rock at its base was disintegrated and vaporized.

Our great adventure was at hand!

"Do you realize that this is apt to be a dangerous, and even fatal venture?" I said to my nephew seriously.

He nodded indifferently, keeping his admiring gaze fixed on the *Penetrator*. "Of course I do, Uncle Ned. But that makes it all the more fascinating! Question before the house is: when do we start? I'm anxious to go."

It was the true pioneer spirit, and my heart warmed to him as never before. I knew right then and there that I could never have picked a better traveling companion. He would be absolutely dependable under any conditions and in any emergency; of that I felt sure.

"Well, you're not any more anxious to go than I am," I told him laughingly. "All we need is to take aboard some water and provisions against any possible emergency. Let's start right now."

He gave an enthusiastic college yell, and then ran towards the house at full speed, in search of old Stubbs, my man of all work. In less than half an hour we were ready to start. An amusing incident happened then. Old Stubbs, on the point of stepping out of the control room, which was situated just under the dome, stopped to stare suspiciously at the complicated apparatus on the walls and ceiling, and at the intricacies of the control board and the control table in front of it.

He frowned heavily, and scratched his gray head.

"Mebbe you know what you're doin', Mr. Ned," he said dubiously. "But—I dunno. Somethin' tells me there's goin' to be trouble with all that there newfangled contraption. Yessir—there's sure goin' to be trouble."

Both Teddy and I laughed heartily because of the doleful expression on the old man's wrinkled, kindly face.

"Rubbish!" I declared confidently. "I don't expect the slightest trouble, Stubbs. So, don't worry. At any rate, we'll let you know by radio in case anything should happen to go wrong."

But Stubbs was not at all convinced by my confidence, and after we had shaken his hand in good-by, and I had given him his final instructions, he passed out to the elevator in the construction frame still shaking his head and muttering to himself.

Teddy and I looked at each other and grinned amusedly. But if in that moment I could have seen into the future—

(At this point an expression of intense pain passed over the face of the narrator, and he put one hand over his eyes as if to shut out some awful sight. But after a few moments he managed to control his emotions, and continued).

I started the synthetic generator, tested it to my satisfaction, and told Teddy to clamp down the manhole door. My hand trembled as I pressed down the lever that controlled one of the large switches in the compartment immediately beneath the control room. Then, while Teddy watched me fascinatedly, I pressed home three other levers in rapid succession.

Down! Down! Down!

A TREMOR passed through the *Penetrator*—we felt it sinking—

"It works! It works!" yelled Teddy delightedly, and in his exuberant joy began to dance a jig.

For a few minutes both of us were kept busy; I at the control board and table, and Teddy at various mechanisms about the room. But when presently I glanced at the dials of the two recording depth meters, I literally gaped with amazement. Unless both instruments were inaccurate, the *Penetrator* had descended to a depth of six hundred feet in four minutes!

Teddy, who was as much astonished as I, made a quick computation on a handy pad. "Great Jupiter! That means that we are traveling into the earth at the rate of almost forty-two miles a day!" he cried exultantly.

This speed, of course, exceeded our most sanguine expectations. Further calculation on Teddy's part revealed the fact that at this rate it would take approximately six and one-half months to complete the 7,925 mile long shaft.

Down! down! down!

"How far down do you intend to go this trip, Uncle Ned?" Teddy inquired, when, after the first hour, we had reached a depth of nine thousand feet.

I pointed to the dials of the two thermostats on the control board, which were registering an outside temperature of 122 degrees.

"As soon as I have found out with absolute certainty whether or not the temperature increases beyond a certain depth," I replied.

"Hm! doesn't look to me as if that temperature increase theory of about one degree for every sixty feet of depth holds good in this particular neighborhood," Teddy commented sceptically, gazing at the thermostat dials. "According to the scientists the outside temperature should now be 222 degrees instead of 122."

I glanced at the depth meters, which now recorded 10,000 feet.

"Yes, but even at that, the actual outside temperature must be several degrees less than indicated," I reminded him, "because the disintegrating process itself generates quite a little heat. But let's wait and see."

I looked at the thermometer, and found that it registered an inner temperature of 105 degrees. "Turn on the cooling plant, will you, Teddy?" I suggested. "It's getting rather stuffy in here."

"I thought you'd soon get hot under the collar, uncle o' mine," he said laughingly, as he threw the switch of the small motor pump, which quickly sent a refrigerating mixture through several copper coils about the room. In a very few minutes the temperature of the control room was down to 85 degrees, and the thermostatic control cut out the motor.

Down! down! down! Hour after hour; mile after mile!

Teddy and I, lunching at the edge of the control table, glanced at the instruments on the control board behind it, found that we were almost three and one-half miles down, and that the outside temperature was now 125 degrees. For the preceding quarter of an hour this had been maintained steadily.

"How about it now, Uncle Ned?" my nephew asked, chewing busily.

"I think we'll keep on just a little longer," I replied thoughtfully. "I have to be quite sure about that temperature proposition, you know, or I'll never be able to interest capital in my scheme."

"Well, there's one thing they can never kick about," he commented. "They'll save billions by not having to timber or concrete the shaft."

"That *is* a most important item," I agreed smilingly. "It's a happy coincidence that the disintegrating process changes the rock at the edges to a glass-like hardness. And, besides, the process does not crack nor disturb the rock in the least. That's another immense advantage over the mining method of drilling and blasting."

"It's that all right," Teddy agreed. "But say—hadn't we better radio a message of good cheer to old Stubbs? He might already be thinking of notifying our sorrowing relatives."

"By all means, cheer him up," I agreed laughingly.

Whistling happily, he cut in the radio set, while I turned back to my business of controlling the *Penetrator*.

The Catastrophe

TEDDY had just passed into the tiny pantry which immediately adjoined the control room, when suddenly, without the slightest warning, the floor of the room seemed literally to drop away from my feet. All the blood from my body seemed to rush up into my brain with a terrific resistless force. There was a frightful roaring in my ears, and a pressure in my head as though it would burst asunder. My legs and lower body felt cold and dead. I had a blurred vision of Teddy staggering in from the pantry—heard his voice as if from an immense distance—

With all the power of my will I struggled to my feet. Then a tremendous jar—a crushing of my body under an awful weight—and then an all-obliterating blackness overwhelmed my mind. . . .

By slow degrees a humming sound penetrated to my consciousness. For a long time I lay prostrate and dazed, listening to it, and wondering where I was and why my head felt so dull and my body so leaden. Gradually, very gradually, gleams of memory began to flicker into the dark recesses of my mind. And then suddenly, with a sort of painful stab, my mind leaped back to that awful drop through space—

By an intense effort of my will, I forced my bruised, protesting body to my knees and looked anxiously around for my nephew. He lay in a huddled heap in the shadow of the control table, and a sob rose to my lips at the thought that he was dead. I forced my pain-racked limbs to drag me to his side, and managed to turn him onto his back, so that the light of the single remaining electric globe shone on him.

Blood was flowing from a deep scalp wound, where his head had evidently struck the sharp edge of a steel table leg. Trembling with anxiety I pressed my ear to his heart and sobbed for joy when I found that it was still beating. By means of the rigid chair and the table, I managed to pull myself to my feet, and staggered into

the kitchenette for the emergency kit. As I was finishing the dressing of his wound, Teddy regained consciousness. With my aid he managed to sit up.

"What in Jupiter happened, Uncle Ned?" he asked dazedly, putting a hand to the bandage on his head. "I felt the floor dropping away from under my feet, and was coming in to see what was the matter—and then something, some great force, seemed to land squarely on top of me, and smashed me to the floor. That's all I remember."

I told him that my experience had been similar to his, and helped him to his feet. By common impulse our gaze went to the depth meters, and what we saw there rooted us to the spot as if we were paralyzed.

Both depth meters indicated a depth of sixty-five miles!

"Great Jupiter—what a drop!" Teddy breathed in awe.

"It's impossible! It can't be true!" I said dazedly. "There must be some mistake. We just dropped into some sort of cavity in the earth, and when we struck, the instruments were jarred out of order."

"But you're all wrong, Uncle Ned," Teddy disagreed. "I recollect the speed of that drop. If we had hit anything hard at that velocity, the *Penetrator* would have been a mass of splinters, and neither one of us would be here to tell the tale." He put a hand to his head and grimaced with pain.

"We *did* strike something, though," I persisted. "That was what knocked both of us unconscious. And that's the very reason why I think that the depth meters are wrong. It seemed hardly more than a couple of minutes from the time when I felt the floor of the control room dropping away from my feet, until I was hurled to the floor by some great weight—the power of momentum no doubt, due to the fact that the *Penetrator* had struck something. The *Penetrator* could not have dropped over sixty miles in that short space of time."

Teddy made a quick calculation upon the pad on the control table, and presently turned to me. "I remember the formula, and here is the result: It took us very nearly two minutes and twenty-two seconds to drop the sixty miles," he announced triumphantly. "The average speed must have been terrific. No doubt the outside wall of the *Penetrator* was fairly sizzling from the friction of the increasingly heavy air. If it hadn't been for that insulation between the two walls we would have been fried alive, I guess."

"All that may be quite true," I admitted thoughtfully. "But don't forget that your formula doesn't take into consideration the retarding effect of the increasingly dense air, to say nothing of the cuplike base of the *Penetrator*, which must have acted like a sort of parachute. If we did drop sixty miles, you may be sure that it took a bit longer than two minutes and twenty odd seconds. But there is one thing certain—we did strike something; because the *Penetrator* is at rest."

Despite his pain Teddy grinned at me.

"Good logic, Uncle Ned," he admitted. "But I bet a dozen new socks we struck something very, very soft, or we would be angels by now."

Again I became aware of the humming sound above, and realized that it was the great exhaust fan. I shut it off, and with sudden thought tried the disintegrating apparatus, listening through the acoustic tube. After a minute or so I disconnected the switch of the disintegrator and turned to Teddy.

"Whatever we struck has absolutely ruined the disintegrating apparatus." I announced. "No doubt the base has been completely smashed."

After a short consultation we decided to open the manhole and find out where we had landed.

CHAPTER III

Trapped in the Depths

VERY, very carefully we loosened the clamps of the manhole door. And presently a peculiar odor, hauntingly familiar somehow, penetrated to us. However, the odor appeared not to interfere with our breathing, and we loosened the clamps still more, expecting every moment an avalanche of water, or possibly mud, to enter.

The manhole was open at last, and we stared out into a region of impenetrable blackness. But there was an atmosphere. And while it was peculiarly heavy, it did not materially interfere with our breathing.

"By Jonah!" I cried, as sudden realization came to me. "That smell—I believe—quick! Teddy, get me that long extension light, will you?"

With willing alacrity my nephew wonderingly brought the light, and I lowered it quickly over the edge of the manhole, illuminating a wide, dully gleaming surface.

"Great Jupiter—we're afloat on a subterranean sea!" Teddy cried.

I said nothing; but quickly passed my index finger over the near surface of the machine and smelled of it. Without a word I held my finger under Teddy's nose. Then we stared at each other in amazement.

The *Penetrator* was floating vertically upon an ocean of crude oil!

A thought struck Teddy and he laughed.

"Let's incorporate right now, Uncle Ned, and form a rival company to Universal Oil," he suggested. "All we have to do is to drop down pumps and a pipe line of sixty-five miles, and we'll be ready to supply the world. How does that strike you?"

"Fine!" I said ironically. "It ought to be easy. But supposing we shelve the oil business for the present, and think about getting back to the surface. How does that strike you?"

"Great!" he laughed. "I'd almost forgotten about that little matter. But— by the way—how do you account for all this oil way down here below the surface, Uncle Ned?"

"That's a matter of conjecture, of course." I replied thoughtfully. "However, the theory is that crude oil is due to the residue of fishes and other inhabitants of oceans during pre-human ages of the world. It is conceivable that, as the result of some great volcanic upheaval, a deep crevice was opened in the earth at the bottom of some great body of water, precipitating its contents—water, fishes and all—into this place, which appears to be some sort of immense cavern. Here the creatures died, and from their decaying bodies this oil

was gradually formed."

"Sounds logical," Teddy agreed. "But what do you suppose became of all the water?"

"I have an idea that most of it is right below this oil," I replied. "That is, of course, if my theory is right. At any rate we'll find out about the water right away."

In brief order, by means of a short length of three-inch pipe, and some wood, leather, and wire, I had fashioned a depth bucket, such as well-drillers use, and we lowered quickly to a depth of fifty feet. I pulled the swing of the trap, and a lot of air bubbles rose sluggishly to the surface, indicating that the bucket was filling.

We soon had it up, and to my disgust it was filled to the top with the heavy, smelly oil.

"Never mind," I answered Teddy's laugh of amusement. "We'll see the next time."

The next laugh was mine though, for from a depth of one hundred feet the bucket came up filled with fresh water.

"We now have plenty of water and oil for our generator, and can charge our batteries to our heart's content," I commented. "The next thing is to travel until we find the shore of this lake or sea, or whatever it is, and try to discover some way back to the surface. At any rate, we can't very well afford to stay here and twiddle our thumbs."

"But how, in the name of Jupiter, are we going to travel—build a boat or something?" Teddy asked curiously. "We haven't any material."

"Let's rest and recuperate for a while," I suggested "And while we do, I'll tell you my scheme."

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Five hours later we were under way. Our manner of locomotion was unique, to say the very least. It will be remembered that the *Penetrator* had four great climbing cog-wheels of eight huge teeth each, and it was these wheels which we utilized for the purpose of propelling the great, clumsy machine over the strange sea of crude oil.

During our terrific fall one of the great cog-wheels had become completely smashed, and in consequence the main fuse of the climbing apparatus had blown, fortunately stopping it, and thus saving the rest from damage. The broken wheel was almost in line with the manhole, which was again lucky for us. We disconnected it and the one next to it from the circuit, and connected the two on the opposite side in such manner that they could act on the heavy oil, and propel the *Penetrator* forward, acting similarly to the paddles of a river steamer, while a slight change in the adjustment of the wheels enabled us to steer our craft.

While I managed our clumsy craft, Teddy took his station at the open manhole, to the side of which we had clamped an improvised search light of a cluster of high-power nitrogen lamps and a large silvered lamp shade. He was the captain, so to speak, and I was chief engineer.

By means of a small compass, I steered in a general westerly direction. This might appear ridiculous at that depth in the earth. But it was really the only way of getting somewhere, and prevented us from running in circles. Meanwhile both of us amused ourselves with guessing what we would find at the end of our voyage.

The Flying Mystery

WE had been traveling thus for a number of hours, when a sudden shout from my nephew called me quickly to his side. He was staring intently at something high up, far ahead of us.

"What's the matter? What are you looking at?" I inquired, curiously.

He shook his head and frowned perplexedly.

"I don't exactly know, Uncle Ned," he said, "but I could almost swear that just a moment ago I saw something move, way up there—something like a large white bat—just beyond the ray of the searchlight."

I leaned back and laughed uproariously.

"A bat! And at this depth in the earth. That's the best joke I've heard for a long time, Teddy!"

He grinned somewhat sheepishly, but kept on staring into the mysterious shadows far ahead of us.

"It does sound rather ridiculous," he admitted. "But at the same time—There! there!—don't you see it?" he interrupted himself excitedly, "—about forty-five degrees up and straight ahead of us?"

With both hands I shaded my eyes from the glare of the searchlight, and gazed intently to where he pointed. For a few moments I could discern nothing. Then I saw it—a whitish, fluttering object, which the reflection from our searchlight's beam revealed indistinctly in the surrounding gloom.

To say that I was amazed would be putting it mildly. For some minutes I was unable to do anything but peer silently at that inexplicable phenomenon. A bat or bird down here? It was utterly beyond reason. Undoubtedly it was some sort of flying creature, for as my sight became better adjusted, I could distinctly see the slow beat of its white wings. But the peculiar thing about it was the fact that, with relation to the *Penetrator*, it appeared to be stationary. Quite obviously it was going in the same direction as we, and at exactly the same speed.

"Why, it's impossible!" I said, when my astonishment finally allowed me to speak. "There can't possibly exist any living creature at this depth!"

It was Teddy's turn now to laugh.

"Quite true, uncle o' mine," he chaffed. "True theoretically, I admit. But there it is just the same, all argument and theory to the contrary. Question before the house is: What is it? And why is it?"

I shook my head in bewilderment. "I haven't the least idea. What do you think?"

"How about a pterodactyl, or some other one of those pre-historic fowls?" he hazarded . . . "Couldn't it be one of those?"

"Rubbish!" I snorted in disgust. "Just remember that those 'pre-historic fowls,' as you call them, were carnivora.* What possible animal food could they find to live on down here, sixty-five miles below the surface of earth? Try again."

Teddy frowned thoughtfully, peering ahead at the object under discussion. He threw out his hands in a giving gesture.

"I don't know, of course," he admitted, "and one

* They lived on animal food.

guess is as good as another; but isn't it possible there might be other animals down here on which they feed?"

"Sure, why not?" I mocked. "Soon we'll come to a cabbage patch, with rabbits and things in it, and there'll be a house or two, and some hearty farmer and his buxom wife will be calling to us to stay and have lunch with them."

With that I left Teddy to his speculations, and went back to my difficult task of running and directing my awkward vessel on its uncertain course, wondering meanwhile what and where our destination would be, and if we would ever be able to return again to our own world. Or would we, I thought, die a miserable death down there in that subterranean world of unknown dangers?

An hour or so later Teddy called to me again.

"A strange thing happened just now," he announced, animatedly. "I was watching that thing ahead, when suddenly a long, thin ray of greenish-white light flashed from it four or five times in rapid succession. And almost immediately afterwards there was a similar flashing somewhere far ahead, as if there was another one of them, and they were signalling to each other."

"Signalling!" I snorted incredulously. "Maybe it's an underground mail-plane," I added, sarcastically, "signalling to the aerodrome that it's going to land."

"Great Jupiter!" cried Teddy, suddenly, gazing at me in strange excitement, "I believe—" Then, evidently anticipating further ridicule on my part, he caught himself, and went back to his business of looking ahead for land.

I wondered in amusement what new idea had come into his fertile mind. Then I resumed my fruitless speculation about how we were going to get back to the surface. Impatiently I wished that we might land somewhere, and find out the why and the how of things.

CHAPTER IV

An Incredible Discovery

"LAND ahead!"

At Teddy's long-awaited, welcome call I rushed to his side, and together we viewed the strange shore ahead, which, in a startlingly vivid white cliff formation, rose from that black ocean of oil like a world of spirits from the darkness of night. Its lofty walls reached to unfathomable heights, and on either side it stretched its ghostly arms until it shaded into impenetrable gloom beyond the range of our searchlight.

As we drew nearer, it was plainly evident that there was no beach, such as the waves of water on the surface form, simply because down here there was no wind, and consequently no motion existed in this strange sea of oil and water.

"It'll be difficult to find a landing, I suppose," I said to Teddy. "We'll have to nose in very carefully and see what we can discover."

Very slowly we worked the *Penetrator* around a low peninsula which jutted out like a long, white and curved arm, into the tiny bay which it partly enclosed. Foot by foot we eased the great machine into the innermost curve of the peninsula, where there was a rocky shelf which, in my opinion, would make an ideal landing place; provided, of course, the deep draft of the *Penetrator* allowed it to approach closely enough. But apparently at that point the white cliff dropped straight down into the depths, for, with the motors completely stopped, our clumsy vessel finally bumped gently against the rock shelf without having touched bottom once.

By means of a small extension ladder, which we laid from the lip of the manhole to the shore, we landed quickly, fastening the *Penetrator* to projections in the rock. And now that the motors and the climber machine were stopped, we perceived that the silence was profound—a tomb-like silence, which, in some indefinable manner which neither of us could explain, seemed menacing.

"I wonder what became of our friend, the bat?" Teddy said, musingly, staring into the deep shadows overhead. "Do you know, Uncle Ned, I think we were very foolish to come without weapons. I have a queer feeling that from somewhere in that darkness about us something is watching us with hostile intentions."

"Rubbish!" I answered. "What, in Jonah's name, would we do with any weapons down here where there isn't anything to shoot at? You're letting your imagination run away with you again, Teddy. Whatever it was has no doubt been scared away by our coming, and chances are we'll never see it again."

After eating a substantial lunch, we equipped ourselves with a canteen full of water and our powerful flashlights, together with some extra batteries, and started out on an exploring trip. We left the searchlight turned on and struck inland along the avenue of its powerful beam, which we had directed straight towards the great cliff walls beyond the strip of plateau on which we were standing.

It was rather rough going, for the rock was very uneven, and as sharp and hard as glass. Apart from its color it reminded me of obsidian and of lava. Small pieces of it which our feet happened to strike gave off clear musical sounds.

"These rocks would be great for a xylophone." Teddy commented jokingly. "When we have settled down for good down here, and I have a lot of spare time, I'll build one and start a jazz band."

"Yes." I said, falling in with his mood. "And you might be able to get your friend, Mr. Bat, to beat the drums for you."

We had traveled about a hundred yards or so, heading for a gap in the cliff, when suddenly a peculiar sound broke the sepulchral silence, and brought us to an abrupt halt.

It was as if somewhere, a long distance away, in the direction of the cliff, an immense bell or gong had been struck, the unutterably deep tone of which trembled through the vastness of the cavern in a manner which was indescribably weird and awesome.

"What in Jupiter's name is that, Uncle Ned?" Teddy's voice was tense with excitement, and his eyes shone eagerly as he stared in the direction of the strange sound.

I shook my head bewilderedly. "You've got me. I haven't the least idea what it can possibly be," I confessed. "But undoubtedly it was due to some natural cause."

We were at the black gap in the cliff now, and discovered that it was not a gap at all, but the mouth of some other cavern or some passage piercing the vast white wall of stone.

"It seems to me the sound we heard must have come from that opening," I suggested. "It probably leads to another cave."

"Very likely," Teddy agreed, "and maybe there we'll also find the explanation for that flying mystery."

"Teddy, I've just about come to the conclusion that your white bat was merely an optical illusion on the part of both of us," I said, thoughtfully. "It was probably due to some defect or speck in one of the light globes, greatly magnified by the curved reflector."

"But you are evidently forgetting the flashes of green light, Uncle Ned," said Teddy, grinningly. "Do specks generally signal to each other."

"You never can tell!" I answered, grinning back at him. "They might, at that!"

A Vast City!

WE switched on our flashlights and entered the black opening in the cliff. A current of fresh air met us, indicating that there was a space or passage somewhere beyond, which might possibly connect with the surface. Otherwise, how could this current of fresh air be explained?

It was an irregular, zig-zagging passage in which we found ourselves, evidently following a natural cleavage between two rock formations, and the floor of it dipped and rose continually. The height too varied anywhere from twenty to fifty feet or so.

We must have been traveling through the passage for a mile or more, when suddenly it took a sharp turn to our right, and about one hundred feet ahead of us we saw its end, outlined sharply with bright orange-colored light!

This totally unexpected phenomenon brought us to an abrupt stop.

"Great Jupiter!" exclaimed Teddy, in astonishment. "If I didn't know better, I'd say that we have arrived at the surface, and that there is old Sol himself shining in and welcoming us back."

"That light is probably the reflection of volcanic fires," I suggested. "And quite likely we shall find that the peculiar booming sound we heard a while back was due to the explosion of volcanic gases."

But my nephew scarcely stopped to listen. With an impetuous dash he covered the remaining yards to the mouth of the passage, and a few moments later I heard his cry of utter amazement. I joined him quickly then, and together we gazed in wordless awe at the incredible spectacle before us.

Several hundred feet below the mouth of the passage there opened a wide valley—of blue-green meadows, and of vast fields of green and gold and purple, and of strange, immense trees of brilliant coloring, extending into the far distance beyond the reach of our vision.

At first, coming out of the darkness of the passage, our eyes were rather blinded by the strong, golden light which poured down over all that strange land from what appeared to be a great number of miniature suns, high up in the unfathomable heights above.

Gradually, as our eyes became accustomed to the glare, our vision extended, so that presently, far in the distance, we saw the glistening waters of a great river, which appeared to traverse the valley in a diagonal direction. And upon the far bank of the river, shining like a multitude of glistening white monuments, we saw a vast city!

As if drawn by a magnet, we stepped forth from the mouth of the passage, keeping our fascinated gaze riveted upon that marvellous sight. A subterranean city! It passed my comprehension.

Suddenly, without the least warning, we heard the rapid beating of many wings about us, and the next moment an avalanche of winged creatures hurled themselves upon us from the air. I began to struggle violently, knocking my assailants to right and left. A quick anxious glance showed me that with his great strength and boxing prowess my nephew had downed three or four of them. Then something icy cold touched the back of my neck, and suddenly every vestige of strength seemed to be withdrawn from my body, leaving it numb and lifeless.

But—strange circumstance—although my entire body was now in a sort of cataleptic state, yet my senses of sight and hearing remained unimpaired, and I could note quite clearly everything that was going on.

Evidently Teddy had met the same fate at almost the same time, for out of the corner of one eye I perceived his still, rigid form lying nearby. I tried to call out to him, but found that my vocal chords were likewise paralyzed. Then I turned my attention to our strange captors, so far as I could, with a rigid head and neck, and closely observed those within my range of vision.

Undoubtedly they were human beings. Their bodies were well developed, and they seemed of average human height. But their shoulders and necks were extraordinarily massive, and I immediately perceived the reason for this: The head of each was almost double the size of either Teddy's or mine!

But there was another thing about these strange people which astonished me—their extraordinary fairness, and the vivid coloring of their intelligent, mobile features.

The Winged People

HOWEVER, there was not the least doubt in my mind of their sex, for they were all of strong, masculine type. One of them stood at my feet with his back turned to me, and I had an excellent chance to study his flying apparatus. It was of apparently simple mechanical construction, and there was none of the complicated machinery with which we of the surface world are familiar. With deep interest I observed the simple and effective way in which they had folded back the large, bat-like wings of a peculiar, almost transparent fabric, and I wondered what their driving power might be.

The powerful wings were attached to a sort of metallic shield on the back, resembling the cellular structure of a honey-comb, which in its turn seemed to be strongly fastened to two wide belts of heavy, shining fabric, colored with alternate vertical, purple and yellow stripes. To the loins was fastened a pair of very short pants,

almost like athletic trunks, and another belt was passed about the chest, tightly laced, and held up by broad straps passing over the shoulders. They wore no head-covering over their long, black hair, but their feet were encased in laced boots, to the back of which the lower ends of the wings were attached.

However, I had only a few moments in which to observe all this, for almost immediately four men, each grasping one of my limbs, placed me upon my back in a sort of net. Before I had time to wonder about the meaning of this, they unfolded their wings in a way I could not discern, and each of them clutched a corner of the net on which I lay. The next moment they rose high into the air with me, and the yellow glare of the many little suns, far, far above us, beat unmercifully down into my face, so that I had to shut my eyes tightly. With an ever growing wonder I speculated as to what those strange lights might be, and who or what these remarkable subterranean people were.

Then, too, I worried about my nephew, and hoped nothing worse had happened to him than to me. What an extraordinary situation ours was, to be sure—to be carried through the air at a great height in a net, as a fish is carried to the shore in a seine, and towards a fate which, like that of a fish, might well end in death!

How long I was thus carried through the surprisingly fresh and sweet-smelling atmosphere of this amazing subterranean world I could not guess. But presently, from some distance ahead, came again that ominous booming sound which Teddy and I had heard in the other cavern. The sound was now much stronger, its deep reverberations awakening thunderous echoes far, far above us.

The booming had scarcely ceased, however, when there was the rushing sound of thousands of wings—above us, below, and on every side of us. And in addition to this a great murmuring noise rose from somewhere far below—the combined voice of a vast multitude of people.

I opened my eyes, and saw hundreds of flyers circulating in close proximity above us, some of whom I judged to be women, because their garb was less revealing and of a gayer color. There were also smaller forms—children. I thought about our children on the surface, and could imagine the immense fun some of our boys, and even girls, would have with such wings. But there was one thing which made these strange people kin to me—their unmistakable curiosity, and their comments in a peculiarly pleasant sounding language.

We descended rapidly now, and presently another sound insinuated itself into my consciousness. It was the rush and roar of rapidly flowing waters.

Then I thought of the large river that Teddy and I had seen, and the great city at its far bank. No doubt we had arrived at our destination. Gently, as if on springs, my four carriers landed with me upon an immense lawn of blue-green grass, and placed me on the feathery softness of it. Again I felt a metallic object pressed against the base of my neck; not icy cold this time, however, but of a pleasant warmth, accompanied by a delicious tingling sensation all over my body. With a rush, energy and life seemed to flow into my limbs again, and a few moments later I was able to rise and gaze about me.

Three or four of our score of captors were watching me closely, probably remembering the weight of my fists against their anatomy, while others were holding back an immense crowd of curious people—some with wings, and some without—who were staring at me exactly as a similar crowd of my own people on the surface would have done under like circumstances. I guessed that our late captors were some sort of policemen, which supposition seemed to be borne out by the fact that each of them carried a sort of short club, a dark-colored stick with a gleaming metal ball on the end of it, which appeared to command considerable respect from the mob.

A Serious Blunder

BY reason of my height of six feet and five inches I could easily look over the crowd at the great trees beyond them which surrounded the vast square—trees of exotic form and covered with immense flowers of brilliant hues, which filled the mild air with a most pleasant, spicy perfume.

But almost immediately my attention was drawn to the gigantic and lofty buildings—if one could call them such—beyond the trees, fantastic and unreal, rising to immense heights—

"Well, what do you make of it all, Uncle Ned?"

It was Teddy, of course, who rather startled me with the sudden question. He had approached me unheard on the soft grass, and now as I looked at him, glad that he was with me again, I noticed that his steel-blue eyes shone with eager pleasure as he gazed about him.

"Great Jupiter—what an adventure!" he said in a voice vibrating with joyous excitement. "I can't help thinking that it's all a dream, and that pretty soon I'll wake up at home and in bed, wondering what I had eaten the evening before."

His drollery tickled my sense of humor, and to the evident astonishment and entertainment of our guards and the spectators I broke into hearty laughter. "By the way, Teddy, how do you like a close-up of your white bats?" I queried.

He laughed merrily, and gazed with interest at a pretty girl nearby.

"Great!" he decided with conviction. "And what do you think of your signalling specks now, Uncle Ned?" he countered.

We had no time for further speech, however, for our guards now ranged themselves about us. Passing the gauntlet through the dense mass of staring and talking people, we were marched towards an immense, pyramid-like building of snowy whiteness looming nearby. A glance over my shoulder informed me that the mass of people were following us, some of them in the air, and some on foot, the latter not having donned their wings.

"For once in our sweet young life we are being escorted in proper style and with fitting ceremony," I remarked facetiously to Teddy.

"We most certainly are," he agreed grinningly. "All I miss is the confetti and ticker tape; the cheering and the brass bands; and the movie cameras and the reporters. But maybe they only have a monthly paper down here, and they'll interview us later."

There was a spacious court surrounding the great white pyramid, formed by a moderately high wall of ornamental pink stone. We passed through the wide-open portal in the wall, and headed straight for the entrance of the building. Behind us the mob of curious people streamed into the court, and continued to escort us to the very door.

And now our attention was attracted to two men, who apparently were awaiting us upon the topmost of the three wide steps that led to the deeply-vaulted entrance.

It was evident at a glance that these two were not ordinary men. Simple, toga-like garments of shining cloth-of-gold covered their bodies almost to the ankles, held together at the waist by loose belts of reddish metallic discs, and their feet were encased in slippers of an orange hue. Upon the bosom of his robe each wore a triangle formed of glittering amethysts.

But I immediately forgot everything else about them in amazed contemplation of their extraordinarily large craniums, far exceeding in size those of the other people about me. Their serene faces bore the impress of great wisdom, and from beneath their enormously bulging brows large, piercing eyes keenly regarded Teddy and me. Long wavy hair of snowy whiteness and silken texture framed their strong, virile, beardless faces, and fell down to their massive shoulders, greatly augmenting their compelling, venerable aspect. Somehow I received the impression of great age.

Involuntarily I found myself bowing deeply before them, and noted that Teddy followed my example.

They held out their hands to us in a grave gesture of welcome, and before our guards could prevent us, Teddy and I passed quickly up the steps and shook their hands in hearty United States fashion.

But it was immediately apparent that in doing this we had committed a serious blunder of etiquette. For the two venerable men drew back with a suddenness as if we had struck them in the face, and glared at us sternly; our guards clutched us and threw us violently to our kneees; and behind us an angry, menacing roar went up from the assembled people.

However, it seemed that the two old men realized almost at once that our blunder had been due to ignorance only, for with a few sonorous words they quickly quieted the angry mob, and then motioned to our guards to release us. Giving us to understand by gestures that we were to follow them, they entered the building.

"It's plain that those two old fellows are labelled 'hands off,'" Teddy whispered to me as we were passing through the triangular portal. "Something like a high-caste Brahmin of India with relation to a Pariah, I guess. Contamination and all that sort of bunk."

"Yes; it appears that we got in bad right from the start," I admitted. "We'll have to be more careful in the future, it seems, or we'll be 'labelled' for an early funeral."

CHAPTER V
Taman, the Thrice Wise

WE found ourselves in a kind of antechamber, the walls of which were beautifully panelled in carved stone of alternate rose and softest green, polished brightly like marble. In the middle of each one of these panels, amidst marvellously sculptured, intricate patterns of geometric design, a large triangle had been fashioned, within which were rows of peculiar characters, which I took to be hieroglyphic inscriptions. These panels, together with the alternate gold and black right-angled triangles of the highly polished, tesselated floor, gave to the whole a most artistic and stately effect.

Directly opposite the outer portal, in the far wall of the chamber, was a second doorway, shaped like a capital A with the top cut off, and closed with what appeared to be a single immense slab of black, polished stone. With slow, measured steps our two venerable guides approached this door, and stopped immediately before it. The one in front of me intonated, in a rising musical scale, three words of seemingly two syllables each. No sooner had he finished, than that which had appeared one solid slab of stone parted exactly in its middle, and its two parts slid noiselessly into the wall at either side, closing again behind us after we had passed through the door.

We traversed a short passage, and entered a vast chamber. Involuntarily Teddy and I stopped just within the threshold, and gazed about us in silent wonder. So immense and lofty was the place, and so brightly illuminated by four of the strange miniature suns high above us, that it almost seemed as if we had passed into the open again. But it was not this immense extent of the chamber which impressed us most—it was the bewildering array of a multitude of shining and glittering apparatus all over its vast, polished floor.

Without doubt this was a great scientific laboratory. A number of yellow-clad men, similar in appearance to our two guides, were serenely and quietly busy at various mysterious tasks about the laboratory. Some were operating huge apparatus of strange shapes, while others were apparently merely observing the action of other apparatus and taking notes upon metallic tablets with a sort of stylus, the points of which appeared to be illuminated with intense, bluish-white light.

With the analytic gaze of an entomologist studying a new insect, our two guides observed the reactions of Teddy and myself to our surroundings, and then motioned for us to continue following them. Some of the scientists glanced at us keenly as we passed them, and one or two smiled gravely, but none of them spoke.

But almost immediately the object which we were approaching claimed our entire attention. From a massive frame of transparent crystalline material were suspended the two horizontally cleft halves of an immense sphere of white metal, highly polished, one below the other, their greatest diameter being possibly twenty feet. Sandwiched between these two hemispheres, and apparently joining their surfaces together, was a great ball of what seemed polished jet, its diameter several feet less. Long rods of yellow-colored material, tapering to needle points, radiated from the huge hemispheres in all directions.

In close proximity to this strange apparatus was a large, oblong structure of yellowish, semi-transparent material, whose flat top was surrounded by a glistening railing. From this top a tongue-like platform jutted over towards the sphere of polished jet.

We entered this structure and found ourselves in an

oval room. And then, at the far end of the room, seated in a chair of crystal, *we saw the Presence.*

At first I was conscious only of a pair of large brilliant eyes, which seemed to penetrate to the innermost recesses of my being. Then, gradually, the other features of that tremendous personality entered into the field of my perception: the strong aquiline nose, the severe thin-lipped mouth, the wide, aggressive jaw, and the enormous, hairless dome of his head, upon which my gaze concentrated in awed fascination. His head was really as much larger than those of our two scientist guides as theirs were larger than ours. A short columnar neck upon extraordinarily massive shoulders supported his great head easily, however, holding it proudly erect. A majesty and power indescribable radiated from him, and there was the impress of awful wisdom in his serene, yet vivid, face.

Something flaming and glittering drew my gaze to the breast of his flowing robe of shining, snow-white cloth, and I perceived that it came from three right-angled triangles, arranged within one another, fashioned from finely-cut jewels. Below this symbol, a wide girdle of white, shining, metallic scales at the waist held together the loose folds of his dress, beneath the hem of which white, pointed slippers were visible.

With one accord we two adventurers bowed deeply before that awful presence, and with a medley of emotions not unmixed with fear awaited our fate.

The man in white spoke a few words to our two guides; his tone resembled the deeper flute notes of a pipe organ. From recesses in the wall the two scientists produced five pairs of small cones; five of the cones were of yellow metal, and the other, and larger, five were of white metal. By means of light straps they fastened one of the yellow cones to their superior's great forehead, and a white one to his solar plexus.

Quickly they equipped Teddy and me and also themselves with the peculiar cones. And then a remarkable phenomenon happened.

The man in white began to speak sonorously, and, to my utter amazement, I understood his every word as if he had spoken in plain English. A glance at Teddy apprised me that he too was experiencing the magic of the thing.

"Strangers of the outer world," came the deep voice, "I, Taman, called the Thrice Wise, governor of the Inner People, demand to know why you have entered this, our land?" It was a peremptory command, and behind the words lay a subtle, but unmistakable, menace.

In a few words I explained my great idea of the intercontinental shaft, and all subsequent happenings, up to the time when we were taken prisoners. Taman listened with concentrated interest, and when I had finished he smiled tolerantly.

"Your idea of thus piercing the earth is good," he said, in the manner of a grown person complimenting a child. "But I happen to know that it is impossible of execution."

"But—why?" I was deeply disappointed and no doubt showed it.

Taman rose from the crystal chair—a giant of a man.

"Come!" he said, curtly. "I shall answer your question in a practical manner."

The Great Ocean!

WITH kingly dignity he led the way to the extreme other end of the chamber, where a very thick metallic cylinder rose upwards from the floor. Within this was a sort of elevator, by means of which the five of us rose quickly to the platform above. Near the edge of the tongue-like projection which I had already noticed from below was a short, heavy pedestal of white, semi-transparent stone, and on top of this was placed a large geographical globe of the Earth, perfect in every detail.

The globe, about three feet in diameter, was attached to a movable axis, and surrounding it vertically from pole to pole was a heavy, square-sided ring of white metal, from which radiated hundreds upon hundreds of needle-like rods in a halo-like manner.

Taman, the Thrice Wise, seated himself in the chair before the globe pedestal. Then by compressing a small lever in the pedestal he caused the globe to rotate slowly about its axis, until the American continent appeared opposite to him. He now stopped the globe and pointed to a certain spot that was designated by a peculiar symbol.

"Can you identify that spot?" he inquired of me.

"Certainly," I answered readily. "That is the location of our largest city, New York."

He nodded. "Watch closely now," he prompted, as with a long white index finger he pressed upon one of the hundreds of tiny yellow buttons ranged in circular rows upon the top of the pedestal. Instantly a slender stream of brightest violet fire flashed from one of the needle points in the vertical ring.

A quick motion of Taman's right hand directed my attention to the great ball of jet in the machine opposite us. About one of the long radial rods of the upper hemisphere played a beautiful, corona-like phenomenon of intense violet light, and simultaneously the sphere of jet appeared to become alive. A sort of maelstrom-like swirling effect of light and shade played within it for a few moments, and then both Teddy and I cried out in utter amazement.

For within the largest vertical plane of the great ball of jet had appeared a picture—a scene of color and intense animation as if we were gazing through a great round window, twelve feet or so in diameter, at the busy street of a great American city from quite close range.

Neither Teddy, nor myself was for a single moment puzzled about the identity of the street vision. For both of us had often visited the "Great White Way" of New York City. But the vision was there for scarcely a minute. Then the view shifted in rapid succession to Central Park, to Wall Street and its Stock Exchange, and finally to Brooklyn Bridge and a part of the busy harbor. Just the merest glimpse of each! Then in a flash everything went dark again within the mysterious sphere of jet, leaving my heart sore with a sudden and violent homesickness.

"That exhibition was not for your entertainment," Taman's sonorous voice announced. "It was to demonstrate two things: first, what this apparatus, which we call Zanoon, is capable of, and, secondly, that we, the

Inner People, know all about your world and the people living in it. You are now in a condition of mind to credit what I am about to show you next. Attend closely!"

He pressed another button—this time one of a semicircle of black ones. Again the maelstrom effect of light and shade appeared within the great black ball, and when it cleared I perceived with a nervous jolt that it held the picture of the *Penetrator* at its moorings. The searchlight was still burning brightly, and within its radiance a great number of the Inner People were moving about, and were passing in and out of the manhole continually. Quite evidently my machine was being thoroughly inspected inside and out.

For a few moments the vision held there. Then it was as if we were passing with great speed over the surface of the motionless sea of oil. We stopped. Then we were passing swiftly upwards. A great cone-like opening appeared diagonally above us. Again we stopped, and seemed to hover there motionless.

Suddenly I understood. The opening was undoubtedly the mouth of the fissure or volcanic duct through which the *Penetrator* had catapulted down. We now seemed to be directly over the spot on the strange sea below, from which a short time ago Teddy and I had started on our voyage of discovery. Truly, many things had happened since!

The vision moved downward—reached the surface of oil—and passed through it! Down—down—down! A few moments of indistinct blurred motion at inconceivable speed— Then the vision cleared again and we perceived a region of green light, within which moved, and floated, and crawled strange, grotesque, and terrible shapes. We saw among these subsea creatures a scene of sudden death, and carnage, and horrors unspeakable.

"Behold the reason why it is impossible to carry out your idea!" Taman spoke sententiously. "The great central ocean of the Earth!"

I was stunned. I could do nothing but stare dumbly at that stupendous spectacle of horrors in the infinitude of green water. Until now there had ever been in the back of my mind the idea of getting back to the surface somehow, building a new *Penetrator*, and starting down again in some other place. But this totally unexpected condition, this tremendous primal ocean at the very core of the Earth, had now absolutely crushed all my hopes!

"You are disappointed," said Taman, ironically. "But there is a still greater disappointment in store for you: Neither you nor your companion shall be permitted to return to your own world!" Saying which, he restored the Zanoon to normal condition and arose.

I stared at him aghast. "But—why—not?" I stammered. "Why are we not permitted to return to the surface?"

His great, intense eyes seemed suddenly pools of devouring fire, and his immense, bulging brow was deeply corrugated with awful wrath. "Because it is my sovereign will!" he thundered vehemently.

He waved his right hand toward the Zanoon.

"There is the answer! It is because for thousands of years we of the elect and our predecessors have studied and watched you people on the surface, and have found without a doubt that you—those of your own color, especially—are an accursed, greedy and warlike race, who, if you learned of this subterranean land, would immediately try to wrest it from us who have lived here in peace ever since the days of the great cataclysm! Now do you understand?"

"But if we would take an oath that we will never divulge—" I began.

He interrupted me with a haughty gesture.

"The oath of a surface man is not worth the breath he uses to express it!" he said contemptuously. "Those who are your leaders make treaties, and pacts, and international laws and agreements continually, and continually break them when it is to their profit to do so. The proof of this is the almost continuous warfare between your white races. Do you dare to deny this?"

"I cannot deny that part of it," I said desperately. "But there are even among our white races plenty of honorable individuals who, when they once give their word of honor, never break it."

"Then why are not such men at the heads of your governments?" Taman asked, skeptically. "Why have not the people sufficient intelligence to elect those whom they know to be wise and honorable instead of those whom they cannot trust? But enough!"

He made an imperious sign of dismissal, and turned to our two guides.

"Have them housed in the topmost apartment of the tower, and see that no one communicates with them. The council will decide their fate."

CHAPTER VI

The Mysterious Woman

As we were traversing the antechamber on our way out, a most remarkable young woman entered it from the court, followed by two others. All three of them were without wings, and were dressed in the usual feminine flying-garb of wider belts and of longer leg coverings than those of the men. But it was immediately apparent that the first young woman was of a higher type than any of those we had seen until now. Not only was this impression due to the more delicate coloring and artistic adornment of her dress, nor entirely to the proud and graceful carriage of her superb body; but there was that in her delicate, yet firmly molded, features, and in her large, dark, and heavily fringed eyes which proclaimed an unmistakable superiority of mind and character.

Royal! That was the thought which occurred to me as soon as I saw her. And that I was not mistaken was evidenced by the fact that, upon a word or two from her, our two distinguished, venerable scientist guides stopped and answered her quick questions with every manifestation of respectful courtesy. It was also quite clear to me that her questions related to Teddy and me, especially to my nephew, for, after a most cursory glance at me, she proceeded to concentrate all of her attention upon him. And it was likewise evident that Teddy's interest was fully equal to her own, for he gazed at her in breathless wonder.

Under his unconsciously rude stare, rich color quickly flooded her alabaster-like face, and her perfectly

formed, coral-red lips curved in a half-amused and half-embarrassed smile, which revealed her fine teeth of snowy whiteness. Her voice, a rich contralto of marvellous range, echoed through the chamber like a perfect musical tone when she spoke.

But evidently the answer of the two venerable men did not please her; for her broad, milk-white brow drew into a frown of displeasure, and in the manner of an impatient, spirited horse, she tossed her regal head, shaking back her black, silken tresses of long wavy hair. But quickly her frown gave place to a dazzling smile, which she directed exclusively at Teddy. After which she evidently thanked our guides for their information, answered their slow bow with one of her own, and, followed by her two pretty companions, continued on to the inner door whence we had just emerged.

Arrived outside of the portal, our venerable companions returned us into the keeping of our late captors, evidently transmitted to them the order of Taman, their chief, and reentered the building. I was seized with a desire to learn the language of these strange people and to discover their history. I wondered too what the conversation between the remarkable young lady and the two scientists had been. Truly it is a very great handicap to be ignorant of the language of a country in which one has to live, even transiently! Never until now had I been able to sympathize with the immigrants whom I had often seen entering the United States for the first time by way of Ellis Island, at New York City.

The great court surrounding the immense white pyramid was still crowded with curious people who, like similar crowds in our own land, were anxious to find out what the fate of the two venturesome strangers would be. Despite the exertions of our police guards they crowded ever closer to us in order to inspect us thoroughly; and especially Teddy's flaming red hair, and my uncommon height seemed to excite their admiration.

Having received their orders regarding us, the guards marched us out through the portal of the wall to the wide, tree-lined avenue which fronted upon the immense square where we had first landed. Then, followed by a concourse of thousands of curious people, we proceeded to our unknown destination—"the tower."

Teddy who, since our meeting with the fascinating young lady, had acted like a man in a dream, turned to me suddenly.

"Great Jupiter, Uncle Ned!" he burst out. "Did you ever in your life see anyone like her? Why—why—I find it hard to believe that she's real! I didn't think nature created anything so marvellously perfect and—and beautiful!"

Although I was occupied with sad and serious thoughts and by the realization that Teddy and I might never be able to return to the surface, my nephew's eager manner amused me.

"Got a bad case, haven't you, Teddy?" I remarked smilingly. "But, of course, I don't in the least blame you. I myself—"

"Great Jupiter, Uncle Ned—" he interrupted me, "you don't think—" And then he stopped in confusion and blushed all over his face and his neck.

"No, I don't think anything," I said laughingly. "But my eyes are as yet pretty good. However, let me give you a piece of fatherly advice, young man: If I am any judge of conditions, that fascinating young lady is labelled 'hands off,' as you would put it, in capital letters. Better be guided by that."

In Jail!

At the end of a few minutes of travel we arrived at the great portal of an immense building shaped like the frustum of a cone as I had noted from the distance. It was built of huge square stones, perfectly cut and fitted, like all the buildings I had so far observed, and its height must have been at least that of New York's tallest skyscraper. Small, round windows, something like the port-holes of a ship, dotted it all over, and I noted that those near at hand had crossed, metallic bars in front of them, fitted into the stone below the outer surface.

A massive, double door of metal admitted us to a great circular chamber or hall, from which many doors led to parts unknown. At two large stone tables about a dozen men were occupied with writing, using the same sort of metal tablets and light-tipped stylus that I had seen at the laboratory.

Four grim-faced men, under the command of a fifth still more grim, relieved our guards of their charge; orders were interchanged apparently; then we were marched to a huge tube, rising vertically from the center of the hall. By means of the elevator within this tube we were whisked upwards at high speed, and a few moments later stepped out into a hall similar to the one we had just left, but much smaller. Four doors, at right angles to each other, opened off from it, and through an aperture in the glass-like roof, to which a comfortable stair of metal led, I glimpsed the golden light of the outer space. Doubtless we had arrived at the topmost apartment which the order of Taman had called for. Furthermore, I had by this time no doubts whatever about the identity of the building. There could be no mistake: Teddy and I were in jail!

He whom I rightly took to be the head jailer led us to one of the doors, flung it open, and disclosed what was evidently a bathroom, divided into two parts by means of a painted or glazed metallic wall—I could not determine which—that came halfway across the room towards the door. In each compartment there was a sort of tabouret on which a set of loin and breast belts had been laid out and under each was a pair of the soft, native, laced boots.

With easily understandable pantomime and grimaces, the head jailer conveyed to Teddy and me his wish that we discard our own clothing, take a bath in the sunken, glassy bathtubs, and then array ourselves in the native dress laid out for us. His heavy, scowling face seemed to intimate that unless we obeyed the order promptly we would be quartered, or boiled in oil, or some such other pleasant prospect. Then, having completed his pantomime to his personal satisfaction, and to the evident secret amusement of his grinning underlings, the head jailer and his men made their exit by way of the elevator, and we were left to our own devices.

Teddy, always a fastidious dresser, viewed with dis-

may the scanty native dress provided. "Great Jupiter!" he cried in disgust. "Are we really expected to wear these abbreviated two-piece bathing-suits?"

"Do as you like," I commented, getting ready for my bath. "But as far as I can see, we have to obey orders, or suffer the consequences. Our friend, old bear-face, the head jailer, looked as if he would rather enjoy a quick lunch out of my leg at the slightest provocation."

Teddy laughed.

"He did look rather tough," he admitted. "Reminded me of an old ex-pug whom I often boxed with. Well, I guess I'll have to get used to the change in fashion."

"Say, Uncle Ned!" Teddy thoughtfully called over the partition a few moments later. "That girl—I wonder who she is? Did you ever see such eyes—such a mouth—such a—"

With a snort of disgust I dove into the bath and let him rave on. The water was not only of an invigorating temperature, but there was a surprising quality in it—an energizing, tingling something—that was positively delightful. Never in my life had I taken a more enjoyable bath. There was a crystalline container with some sort of liquid and deliciously aromatic soap which furnished a most amazing lather, and on the wall were several knobs by the manipulation of which I was able to control both the temperature of the water and its peculiar energizing and tingling effect, which I suspected to be due to some electrical quality in it.

"Isn't there a towel on your side of the fence, Uncle Ned?" Teddy asked grumblingly. "I've looked everywhere and can't find one. I'll bet a dozen new socks the laundry-man is out on a spree and forgot to leave any."

Contented Jail-Birds

I HAD not thought about a towel. My searching gaze revealed not a towel, but a deep niche in the wall, a trifle higher than a tall man, to which a narrow grating led from my bath. The back of the niche was formed by a sort of perforated screen of metal.

"Just a minute, Teddy!" I called with sudden understanding. The next minute I had stepped into the niche. And no sooner had my feet touched the grating on its floor than a warm blast of air played all over my body, coming from the perforated screen.

"I've found the towel, Teddy!" I announced with the pride of the discoverer, and explained it to him.

"It's a great scheme," he called back a moment later. "It ought to sell easily back home. Let's incorporate!" he added with a laugh.

"What—again?" I cried in simulated alarm, humoring him. "Why not wait until we've put that oil deal over, Teddy! Let's not bite off more than we can comfortably chew."

"Chew!" he cried animatedly, and smacked his lips. "That reminds me: I'm as hungry as a healthy bear just back from hibernating. When and where do you suppose we eat, Uncle Ned?"

"Ask me another," I said peevishly, struggling into the breast belt which our amiable jailer had provided. "As soon as I can manage to wiggle myself into this corset thing here, we'll go on a foraging expedition."

In front of the door we met, looked each other over, and simultaneously roared with spontaneous laughter.

"Great Jupiter, Uncle Ned!" exclaimed Teddy, weak with laughter, "you look exactly like Knute Larsen, the terrible Swede."

"And you, with your sunburn and burning hair, look like Umpum-wumpum-wuff, chief of the head-hunter islands," I came back at him.

The foraging expedition proved highly successful, for in the adjoining room we found a cold lunch laid out, consisting of an amazing variety of strange fruits, mysterious salad-like dishes, several different kinds of meat and fish, and a sort of spongy, salted cake which made an excellent substitute for bread. There was also milk to drink, which reminded me of goat's milk, and in addition a sort of mildly effervescing beverage, evidently of fruit juices, that aroused our whole-hearted enthusiasm. All in all it was an exceedingly satisfying meal.

"If that's the way they feed jail-birds here, I'd rather be in jail than out," said Teddy with a grin, leaning back contentedly.

"Maybe," I said skeptically. "But I have an idea that this is not the regular prison fare. Ask Taman, the Thrice Wise."

"What a tremendous personality!" Teddy said, musingly. "Wonder what he meant by saying that the 'Inner People,' as he calls his race, have lived here ever since the 'great cataclysm'?"

"I've been thinking about that," I answered thoughtfully. "And it has occurred to me that, at one time, these people, or rather their ancestors, might have lived on the surface, and that, owing to some great natural convulsion, or possibly some sudden climatic change like a glacial period, they were compelled to immigrate into this subterranean land."

"Sounds reasonable," Teddy agreed. "They must have been living here for ages, though; because at college we went into the ancient histories pretty thoroughly, and in none of them was there ever a word mentioned about any subterranean people."

"Don't worry," I said ironically. "You'll have plenty of time to get acquainted with their history if, as our friend Taman pointed out quite emphatically, we have to spend the rest of our life down here."

"That's right, too," he said frowningly, "I'd forgotten about that little thing." Then, as a quick, dreamy smile replaced his frown: "But there might be agreeable compensation. That girl—"

I rose hastily. "Come on, let's explore the rest of our jail," I suggested, and passed quickly out into the hall.

The metallic stairway attracted me. I ascended it rapidly, and found myself on a flat circular roof, which was entirely surrounded by a stone parapet, some three feet or so high. Teddy joined me, and together we leaned our elbows on the parapet and gazed upon the strangest city anyone could ever hope to see.

CHAPTER VII

Another Meeting

IN a direction away from the near-by great river, and toward either hand as far as our vision could reach, extended a vast multitude of strange pyramidal and

conical structures. A geometric city!

It was a fantastic array of pyramids and frustums of pyramids—triangular and square—hexagonal and octagonal and others. And cones, and frustums of cones, there were—tall and squat, and thick and slender; and like the pyramidal varieties in many colors, among which white and rose predominated. But if the shape and sizes of the buildings differed, their arrangement in relation to one another was of the most perfect geometrical harmony. The beautiful, artistic gardens with which nearly every house was surrounded, and the stately, flower-bedecked trees that lined both sides of every avenue and street and encircled all the squares, vastly augmented the collective harmonic effect, and rendered the whole strangely beautiful and exotically fascinating.

There was, however, one building in the distance, apparently near the edge of the city, which seemed to differ from all the others—a great hemispherical structure of a flaming crimson color. We wondered idly what sort of place it could possibly be—little dreaming of the terrible significance it was soon to have for us.

If the city itself was greatly interesting to us, its inhabitants were even more so. A vast multitude of them animated the broad avenues and streets, busily hurrying to and fro, like the people in any American city, while other thousands flew and fluttered and glided at different speeds in the bluish-colored air above the city; their colored loin and breast belts, together with their flashing, semi-transparent wings, reminding me of flocks of gamboling tropical birds. Idly we commented upon their probable mode of life, and wondered whether among them there was as much poverty and misery and discontent as among our own people.

Suddenly a great rushing noise sounded from the direction of the river, and a minute later a huge bird passed by far overhead at a speed which could not have been less than a mile a minute.

"By Jonah!"I cried in amazement. "Do you see what I see, Teddy? Or am I dreaming? That bird seemed to be as big as any airplane I ever saw."

Teddy, who was as astonished as I was, turned to me and grinned.

"I saw it all right, all right," he admitted. "Never again will I doubt the story of Sinbad the sailor after this. But Sinbad's bird must have been a mere chick compared to that monster there. Tell you what, though, Uncle Ned, I'll bet anybody a dozen brand-new socks that what we saw wasn't a bird at all."

For a moment I stared at him, and then realization came to me. "And I bet you'd win, Teddy!" I cried animatedly. "I remember now—the bird had neither feathers nor legs. It was simply a marvellous flying machine, using wing power like a bird."

We had watched the swift flight of the great,bird-like flying machine, and now perceived others of its kind, passing rapidly back and forth far above the level of the individual flyers. We concluded that they were probably freight carriers between the different parts of this strange land, and our respect for the ingenuity of its inhabitants grew.

"Of course, I doubt whether those machines would fly at the surface," I commented. "We must always remember that the density of the air down here is very much greater than in our own world, which in regard to machine flying is bound to make an immense difference."

Teddy nodded. "I wish I had a pair of those wings, though," he said longingly. "It must be a lot of fun to fly around like that."

"I don't know about that," I said dubiously. "Personally I prefer the solid ground for traveling. But on the other hand, if we don't care to spend the rest of our life down here, it might come in handy to know how to fly one of those things. If the ancestors of this race of people ever lived on the surface of the earth, then they must have come down somewhere. It's up to us to discover where, and then watch our chance to escape."

Teddy was just going to answer me, when there was the quick beat of wings behind us, and we turned just in time to witness the graceful landing upon the roof of the fascinating young lady who had been in my nephew's mind since our meeting in the antechamber of the great pyramid.

With a peculiar motion of her elbows she caused her wings to fold neatly out of the way, and then, with the effortless graceful movements of perfect bodily co-ordination, she tripped rapidly over to where we stood. I immediately noticed that she was equipped with a set of the marvellous "communication-cones"—that is what I had named them—and that she had brought two other sets with her. She gave me a glance and smile of recognition, and then proceeded to devote her entire attention to my nephew.

I smiled to myself. Quite evidently it was a double case of love at first sight. I could not blame either of them, however. For while the girl was of a most extraordinary beauty and charm, Teddy looked like a young Greek god. The scanty native costume of green and gold exhibited to the fullest advantage the most unusual physique which his athletic college training had given him, and this, together with his strongly masculine, finely chiselled features, clear steel-blue eyes, and remarkable wavy hair of ruddy-gold, made a fascinating combination for any girl.

A Dangerous Encounter

FOR a few moments they just stood and gazed at each other. Then, just as she was about to hand Teddy a set of communication-cones, a swift shadow passed over the roof, and the next instant a large darkly handsome native in crimson and gold landed by the girl's side. Not taking time even to close his wings, the man grasped her roughly by the arm, and jerked her away from my nephew's side. He addressed her in quick short sentences, and from the vicious frown on his great, bulging forehead, and the glitter in his large, dark eyes, it was easily evident that he was intensely angry.

However, it became at once apparent that the girl had a temper of her own. With a quick motion of her marvellously modeled arms she shook off the grasp of her countryman, and her queenly head snapped proudly erect. Her eyes were blazing with cold anger, and when she spoke to him, her words sounded haughtily icy.

But it seemed that the big man in crimson was not easily abashed, for he gripped the girl's arm again and spoke to her in a threatening, exasperated manner. But at this moment Teddy stepped up to the man and from the set of his jaw I knew that some decisive action was imminent, and I thrilled with pleasurable anticipation. His left hand clamped down upon the fellow's wrist, and his right on the elbow. A quick pressure upon a certain nerve, and with a cry of pain and fury the girl's aggressor released her arm precipitately and turned against her self-appointed protector.

The man in crimson was a trifle taller than my nephew, and also quite a bit heavier, and it was evident that he expected an easy victory. But a quick glance assured me that the girl's eyes were fixed upon Teddy with an expression of utter confidence in his prowess. It warmed my heart towards her.

The big native made a vicious pass at my nephew's head, which, if it had landed, would perhaps have terminated matters right then and there. Not without reason, however, had Teddy been the boxing champion of his college. He merely rolled his head aside, and as the man's own momentum jerked him forward, sent a stiff uppercut to his jaw which caused him to stagger several paces backwards. But the blow merely served to increase his fury, and he came on again, charging like a raging bull and swinging his powerful arms like flails. Teddy coolly watched him advance, and then, side-stepping neatly, floored him with a solar plexus blow.

But evidently the man in crimson was tough, for in a few moments he had caught his breath again and returned to the attack. However, he appeared more cautious this time, and I thought that I detected cunning in his eyes.

"Look out, Teddy—he's up to some trick!" I warned.

Suddenly the man whipped from his loin-belt one of the peculiar clubs we had seen the police use. I happened to glance at the girl, and saw her blanch, while an expression of fear leaped to her eyes. I wondered amazedly why the sight of a mere club should induce such an emotion in her. Clearly she was afraid for my nephew, terribly afraid.

The native gave a quick leap forward, and at the same time lunged against Teddy with the club as if it had been a sword. But with his trained quickness of eye my nephew had seen it coming. He side-stepped, bent down, and with the same motion brought up his left arm in an upward sweep, striking his knuckles sharply against his aggressor's wrist. With a cry of rage the latter dropped the club and nursed his wrist; the next moment he had leaped on top of the parapet, started his wings, and rose into the air. A score of feet above us he circled, and I could see that his face was black with rage. He called to Teddy sharply in the native tongue, and, although I could not of course understand what he was saying, there was such utter menace expressed in his tone that I shuddered involuntarily. I glanced at the girl and knew from the expression on her face that the man in crimson had uttered some terrible threat. Twice he circled the roof and then flew rapidly away.

I turned to my nephew.

"Teddy, boy, I am very much afraid you've put your foot into a considerable jam," I said anxiously. "I have an idea that this fellow was a person of considerable importance, and whatever he said when he was leaving, I don't think it sounded like a blessing, nor an invitation for dinner."

He laughed unconcernedly. "I should worry what he said. Anyway, I think he has learned that it's not good for his general health to get rough with this young lady when little Teddy is around."

The young lady in question had watched him with intense admiration, and now when he turned to her again, rich color flooded her delicately rounded cheeks. She offered both of us the communication-sets she had brought, and when we had adjusted them to our heads and solar plexuses, she spoke to Teddy immediately.

"Dear friend, do you know what you have done for yourself by protecting me in such knightly manner?" she began gravely. "You have made a very powerful enemy. The man whom you so bravely defeated is named Sarro. He is the eldest son of the former governor of Raa, this city, and holds the very important position of Minister of Police."

I tried to flash Teddy an I-told-you-so glance. But he did not pay any heed to me. His entire attention was fixed upon the girl.

"But why did he treat you so brutally?" he demanded. "What did he want of you? He certainly didn't act like a gentleman."

"Sarro desires me in marriage," she explained simply. "Therefore he is extremely jealous, and annoys me very much. He is also very proud, and I know he will never rest until he has finally revenged himself for the insult to his pride which you have inflicted on him. He is absolutely remorseless, and I am very much afraid for your safety." Her expressive eyes, large and velvety, appeared deeply troubled.

Teddy surprised me by taking one of her slender, white hands tenderly between both his own, and then further astonished me by raising it to his lips in the most approved movie hero fashion. But apparently he did it almost unconsciously, and his face was quite grave as he looked into the lovely eyes of the girl. He seemed to have something weighty on his mind, and I wondered what it was.

"I am not the least bit afraid of Sarro, even if he is the Minister of Police," he said simply, as if that matter were of the least possible consequence. "But please answer me one question: Do you—er—care for him?"

Her head snapped proudly erect, and her eyes blazed suddenly.

"I hate him!" she cried vehemently. "I will never marry him, although Taman, the Governor, desires it. I am Noama, the granddaughter of Taman, the Thrice Wise, you see," she explained.

CHAPTER VIII

A Fatal Weapon

EVIDENTLY her words had removed completely whatever secret anxiety my nephew had harbored; for now he suddenly smiled at her in his

old, care-free manner. His eyes shone with a warm light as he bowed in acknowledgement of her informal introduction, without, however, releasing her hand—a fact which neither of them seemed to notice.

"Noama—Noama," he said, experimentally, his voice caressing the words. "I have never before heard such a beautiful name!"

Noama blushed deeply, but made no attempt to withdraw her hand from his grasp. Her great dark eyes glowed with a wonderful light.

"But you have not yet told me your own name, my friend," she reminded him gently. And then, when my nephew had complied: "Tedde-e—Tedde-e," she enunciated softly. "Why, I think that Tedde-e is so much more beautiful a name than my own, my friend."

Things were getting decidedely too uncomfortable for me as the third of the party, and I determined to butt in then. I had meanwhile carefully picked up by its handle the peculiar club that Sarro had dropped so precipitately, and now held it out to Noama.

"Will you kindly inform me what sort of weapon this is?" I asked courteously. "Is it a club to strike with?"

She shook her head and smiled dreamily. Then, with evident reluctance, she disengaged her hand from Teddy's grasp, and took the object under discussion from me.

"No, it is not a weapon to strike with," she explained. "This metal ball contains a great number of tiny chemical globules, which, when the liquid from this handle is sprayed onto them by means of pressing down this small lever with the thumb, can temporarily draw from the atmosphere an enormous amount of positive electricity. When the ball is thus charged and is touched to any body or thing of conductive material the result is quite destructive, because then the high pressure electricity is instantly released. We call this weapon Kra, which in our language means destroyer. Come, I will demonstrate its power."

Taking Teddy by the hand she led him to the stairway and down to one of the two rooms which as yet we had not explored. It was brightly illuminated by the golden outside light which came in through the round windows, and contained several peculiar forms of apparatus along its walls which at once excited my liveliest curiosity. There were also several shelves like bookcases in one corner, crammed with the remarkable metallic tablets which I had seen in use at the great laboratory, as well as in the receiving hall of the prison.

"This is the entertainment and study room," Noama explained. "You see, this part of the prison is reserved for prisoners of high rank, and for that reason special arrangements are made for their comfort."

She walked towards the massive stone table which stood near the outer side of the room, and behind her back Teddy and I grinned at each other.

"Did you get that—'prisoners of high rank?'" he whispered. "There's no use talking; blue blood, like murder, will out!" Whereat I gave him a hard dig in the ribs and told him to shut up.

Noama picked up one of several thick metallic books that lay on the table. She rapidly turned its thin pages of flexible metal to make sure that there was no writing in it, and then told us to watch. We saw her press her thumb on a small lever in the lower part of the Kra's handle, and a moment later she lightly touched with the glittering ball of the weapon the heavy metal cover of the book she had examined. There was a vivid, blue-white flash of fire, accompanied by a sound like the ripping of cloth. Teddy and I then stared in utter astonishment at a hole, fully one inch in diameter, which the electric charge had burned clear through the entire thickness of the book to the stone table on which it lay.

Teddy emitted a long whistle of astonishment. "Some little club, isn't it, Uncle Ned? Luckily I am fast with my fists, or you would be attending little Teddy's funeral by now."

Our astonishment and Teddy's comment amused Noama, and her musical laugh delighted us both.

"Of course, the handle of the Kra is of almost absolute insulating quality," she continued her explanation. "And another feature of the weapon is that the quantity of energizing liquid which is sprayed onto the chemical pellets can be regulated, so that a touch of the Kra may induce merely temporary paralysis of the muscles."

"All of which explains fully our experience when we were taken prisoners," I observed to Teddy.

"Yes, that was what they did to you," Noama concurred. "And later your guards merely restored you to normalcy by means of a Loo, an instrument shaped similarly to a Kra, but which absorbs negative electricity only, and is used for resuscitation, as well as for the quick healing of wounds and broken bones."

Teddy gazed at her wonderingly.

"I am beginning to think that, so far as scientific knowledge is concerned, and probably other things too, we surface people are in an elementary stage compared to you marvelous Inner People. Take for instance these wonderful communication-cones here, by means of which we are able to converse easily, without ever having learned each other's language. It seems pure magic. I can't understand it."

Noama smiled at him tolerantly.

"But it's not so wonderful after all, Tedde-e. It means merely the utilization of another one of nature's laws. As you know, when we desire to communicate our thoughts to others, certain images form in our minds, which in a passive mental state radiate in all directions like invisible waves. But by our volition we are able to radiate these thought waves strongly in one direction, or to one person only in a given case, one way of expressing our thought being in the form of audible language. Is that clear to you?"

"Perfectly, so far. I am deeply interested."

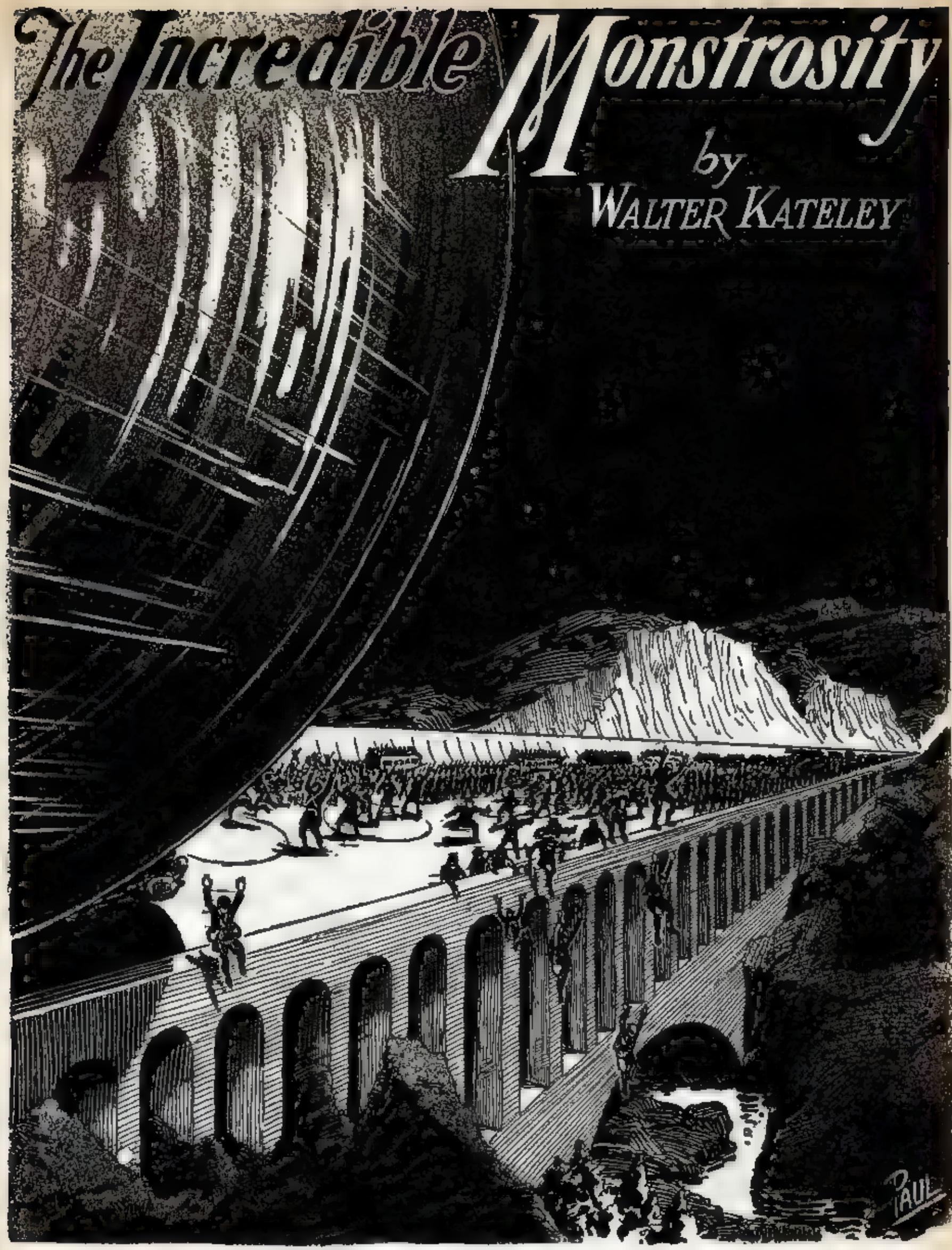
Noama Is Curious

"WELL then, those cones—we call them Sonaa, thought transformers—are for the purpose of conveying thought directly from one person to another, or others, without the use of audible language. For instance, when we are listening to a musical symphony concert, or when we are watching a theatrical performance, and desire to address a few words of appreciation or criticism to a friend, we have no need to do so audibly; we use the Sonaa, which at such times nearly everyone brings along. Thus no one is disturbed by

(*Continued on page 75*)

The Incredible Monstrosity

by WALTER KATELEY



(*Illustration by Paul*)

A vast bulk loomed suddenly out of the darkness and towered above the army for a frightful second—thousands of tons of metal rushing down . . .

THE INCREDIBLE MONSTROSITY

By the Author of "The World of 100 Men," "The Gold Triumvirate" etc.

"I CALLED you in, Verne, because I want to discuss with you the possibilities of a better transportation system. In fact, this system I have in mind must be something really new. Refinements of our old methods won't do. We've got to have something radically different from anything we ever had before."

Andrew Hardy was speaking. He was president of the largest transportation organization in the United States. He controlled railroads, steamship lines, and aviation companies. If it were not for the anti-trust laws, he and his associates would in all probability have owned a controlling interest in every carrier in the country. As it was, the Universal Transportation Company, while undeniably the most important company in its field, faced a good deal of keen competition.

Hardy was addressing the company's chief consulting engineer, a tall, spare, out-of-doors man who bore on his face the stamp of superior intellect. Benjamin Verne, as will be remembered by those who have read the story of his life, was a world-ranging, restless, mechanical genius who had settled down at last in the most lucrative post he could ever hope to attain. That he had held it for many years was a clear indication of his great ability.

WALTER KATELEY

MR. KATELEY gives us now a story of an entirely different type. Imagine a great sphere 1800 feet in diameter rushing across the continent at the speed of sound. Here is truly an instrument of power and destruction such as no man has seen. Yet the use of this incredible monstrosity will be as complete a surprise to our readers as it was to the editors. Mr. Kateley has built about the monstrosity, which may be likened to the terrible Juggernaut of history, a tale of breathless events and intriguing mystery.

This story we believe opens to Mr. Kateley a new field of writing which undoubtedly will serve to increase his reputation immensely.

"What we need," continued the financier, "is a much more rapid and much less expensive means of transportation—although I guess rapidity is the most important factor. We can fix the prices later. The point is, Verne, that our transcontinental traffic is especially cumbersome and wasteful, when you compare it with an ideal system, to say nothing of its being exasperatingly slow. Fruits and all perishable foods, as you know, have to be shipped in refrigerator cars. That costs money. Our planes can take care of passengers, but they can't carry freight-train loads. And three hundred miles an hour is beginning to look pretty slow for passenger travel. Every one of our competitors has equalled it. What's worse, shipments that go by way of the Canal must pay heavy tolls, and stand delays. Aside from the airplanes, our whole system is archaic. We're not keeping up with the times."

"You're not saying all this because you don't think we measure up to the rest of 1970, are you? Something tells me," added Verne, with a smile, "that you want to wipe our esteemed competitors off the commercial map."

"Naturally," answered Hardy. "This is business. What we need is a *daily* service from the Atlantic to the Pacific, both passenger and freight—especially freight."

"That would be some speed," commented Verne, caustically.

"It does seem like a pretty big order," admitted his superior, "and I'm aware that with present methods it would be impossible. But sometimes the apparently impossible has been accomplished. You've brought about a few miracles yourself. That's what you're getting paid for."

"Well, I don't profess to be a miracle man," said the engineer. "Someone else might have worked out the problems just as well as I."

"That's irrelevant. We have at present a large surplus of funds which we've been accumulating for just this sort of enterprise. I feel justified in saying that the capital at your disposal is practically unlimited, and we will use it if a feasible plan can be worked out. So the cost, although it may be tremendous, is no worry of yours; you can safely leave that to the bankers. But the engineering problem is a different matter.

"Now I have been hoping that you might be able to suggest some plan. Of course, I don't expect you to think of one off-hand," he added, as he saw a very dubious look clouding the engineer's face. "But I thought that in time you might be able to work out something practicable."

"It's a large order," said Verne. "You know that my own research keeps me pretty well occupied, and then there's the regular routine business I have to attend to personally. If I get an idea I'll have to stop work on everything else."

"Suppose you leave the affairs of your construction work pretty much to your assistant, Babcock," answered the head of the firm. "Devote a few months or even a year to the consideration of this problem. Babcock seems to be rather a capable fellow, and you could help him out in case of emergency. I think I can answer for any preliminary expense you may see fit to incur."

Verne hesitated for a moment or two. "This is really a little out of my line," he said, "but it is just possible that I may stumble on something. To-morrow,

though, I was planning to go on my vacation."

"Oh, well, that's all right!" rejoined Hardy. "There's no particular hurry about this matter. Take a vacation and rest up. There will be time enough for actual work later on. The world was not made in a day. Just think it over and have it in mind when you return. Take all the time you want. I know you won't take very long. If you make any progress, call me up, or come in here and tell me about it."

Benjamin Verne left the executive offices in anything but a happy frame of mind. He thought this might be the beginning of the end of his very enviable position. He was the highest-paid consulting engineer in the country, and now he had been asked to turn the major portion of his work over to a subordinate, and to waste his time on a seemingly impossible task.

Perhaps the directors of his organization would see fit to dispense with his services entirely when they found him unable to perform the herculean task allotted to him.

Anyway, thought Verne, there was no use worrying about it. He would dismiss the subject from his mind until he had taken a good rest. After vacation, when his system would be toned up and his mind refreshed, the situation might clear up. He remembered that his father had often said that little-souled people spent the better part of their lives worrying about things that never happened. He determined he would not fall into that category.

A Lesson From a Scarab

ONE afternoon a week later, Verne was stretched out in the shade of a huge silver maple tree, reading a book—one that as a boy he had read many times. He had long been in the habit of re-reading one or two of his old books whenever he returned to his farm for a vacation. It was a restful reminder of old times.

At length his mind wandered from the book, and he lay idly dreaming. Then something on the ground beyond the path caught his eye. A little ball as large as a good-sized marble emerged from the edge of the grass and rolled out onto the bare ground.

It came to a standstill only after it had traversed a slight incline for two or three feet and reached the lowest part of the path. At the same moment a black beetle emerged from the grass and came scurrying after the little sphere. He made a couple of turns around it, as though examining the lay of the land; then he put his head down nearly to the ground and, supporting himself on his forward pairs of legs, swung his hind legs high in the air. In their grotesque actions they resembled the arms of an ungainly derrick.

The beetle backed up to the ball, which was more than a dozen times as large as himself, and, setting his hind feet vigorously against it, started to roll it away. The performance was no surprise to Verne, for he had been familiar with it since his boyhood days. But since then he had learned a great deal about zoology, entomology, and ancient history. His reactions were different now from what they had been when he used to watch the funny little tumblebugs standing on their heads and kicking along the big balls of dung in which the eggs had been deposited for incubation.

The beetle had gone a little way down the path; and now he turned and came back, leaving a crooked trail in the dust behind him. The engineer fell to thinking how strange it was that such a tiny creature could roll such a large ball. His feet and legs were so minute in comparison to his burden! "There must be some very efficient mechanical agencies at work here," mused Verne, "when a little bug can transport twenty times his own weight for a long distance, up hill and down dale. Too bad we human beings can't develop such efficiency in our methods of transportation.

"This beetle must be a first class transportation engineer—"

Verne sat up with a jerk. Was this the secret he was looking for?

He approached the tumblebug on hands and knees and observed its actions very minutely. Manifestly, if this great load were of any other shape, the insect would never be able to budge it. Obviously, Nature had imparted to the little scarab, thousands of years before, a valuable secret, one that groping human beings had not learned in all the years of their estate.

Here was indeed a great mechanical principle involved. What could be easier to move than a perfectly balanced ball? Easy—yes—and better yet, there was no machinery to get out of order.

Verne felt physically weak under the impact of a tremendous idea. He went back and lay down under the tree. He wanted to think; to think about a very large ball, a ball that could be moved very easily, and very, very swiftly. Two hours later, when the dinner bell rang down at the old farm house, he was still thinking. As he rose to his feet he said aloud, as if talking to himself, or to an invisible companion: "Yes, that's the solution. A ball big enough to roll across the continent in a single day!"

There followed a week of the most intensive thinking Verne had ever done. In spite of himself his vacation was over. Try as he would, he could not get his thoughts off the schemes that were gradually shaping themselves in his alert mind. This fascinating new idea hypnotized him.

Once back in the city, he immediately telephoned Hardy that he had a partially developed scheme in mind, and that he was going into the experimental laboratories of the company to work on some models. He plunged into his new project with all that vigor that had lifted him above the run of engineers and made him what he was.

CHAPTER II

Verne Demonstrates It

TWO months later Verne called his assistant, Babcock, to his inner sanctum.

"Bill," he said, "I think we can solve the whole thing with electromagnets. The only problem remaining is—what speed shall we attain? I can't have the ball moving with the speed of light, which it is likely to do if I actuate it with an electric current. Magnetic fields, you know, move with almost the speed of light. I wonder if you couldn't try out something else—say, actuating the magnets by sound?"

"Why not? As long as we're going to play around with Hardy's new toy, let's give him a run for his money. Personally, I think the whole thing's only a fad. I'll bet the directors don't even know anything about it." He spoke into a telephone connecting the office with the laboratory. "Wilmark? Rig up something like the televox motor that works by sound and connect it in with the track for the beetle ball. Yes. When I say "Giddap!" the ball will roll. Yes, that's the idea."

As soon as he conveniently could, Babcock left Verne's office and hurried to a television-telephone booth in the building. For some reason he did not use the office equipment. He dialed a number and waited. Presently a man's face appeared and his voice answered.

"Glad I got you," said the engineer. "Verne has a great idea." And he proceeded to give the details of his chief's latest plan. "I'll let you know more when it's been tried out. I really think there's something to it."

"There *is* something to it," grumbled Kilpatrick, head of the Universal Transportation Company's largest competitor. "A lot of expense. But go ahead, anyway. Hardy isn't going to own the earth—not by a long shot."

When, a month later, Verne and Babcock entered Hardy's office to demonstrate the working of their model, the chief engineer had already decided upon his course of action. His brilliant mind, leaping from one hypothesis to another, projected itself into the future, and called up the picture of a vast trans-continental system of transportation without parallel anywhere in the world. And Verne was no dreamer, but a man of action.

Hardy was waiting for him. "I hope you will pardon my bringing such a large affair into your office," said Verne, indicating the long cardboard carton a porter had brought in, "but you must remember this is a trans-continental affair."

The carton was placed on a large, flat-topped desk, which had been hastily cleared of its usual equipment. Verne and Babcock exposed the model. It consisted of a ball about six inches in diameter, mounted on a shallow trough-like runway perhaps five feet in length. A number of miniature buildings, obviously power stations, were set at regular intervals along the runway; and at much shorter intervals was a series of minute lens-shaped objects mounted on low pedestals.

"Of course," said Verne, as he adjusted the apparatus, "with this I can only give you the merest indication of what my scheme is like. I don't mind telling you that I got my idea from a greater engineer than I am—from a tumblebug."

Hardy laughed. "So you want to build an iron insect, eh? I didn't think you'd get as desperate as all that, and even if you did I never expected you to admit it." He watched Verne's preparations with an amused smile. Evidently he was thinking of a child's mechanical toy being demonstrated in a store.

"We should have someone to play Santa Claus, and let the children see it," he remarked genially.

"If we should decide to try to build this thing," replied Verne, seriously, "it will be the farthest thing from child's play that was ever attempted."

"Now this ball," he continued, "represents the conveyance, the carry-all, so to speak." He placed the object in question at one end of the runway. "These"—indicating the small buildings—"are power houses to furnish the motive power; and these minute discs that you see placed so close to each other all along the route are sound reproducers and magnifiers.

"This very bright belt around the ball is of specially prepared steel, and very susceptible to magnetic attraction; and you will notice a thick band of metal of the same width along the bottom and in the middle of the runway. You will observe that this band of metal is marked off into sections. Besides furnishing the track to support the ball, it is in reality a continuous series of electro-magnets."

"I suppose you have a gyroscope or something inside?"

"Nothing of the sort. The ball is a perfect sphere, perfectly balanced. The bands along the raised edges of the runway are only guides to keep it in place. When the electric current is turned on, the electromagnets are sensitized, one after the other. They exert a tremendous pull on the ring around the ball, in the same way that a different type of electromagnet lifts heavy loads of metal in the steel plants and junk yards."

A Tremendous Scheme

VERNE paused a moment to allow the financier to grasp the idea.

"This pull exerted on the forward portion of the ring," he continued, "draws it downward and causes the ball to roll forward and onto the magnet. Then the current is withdrawn from this particular section and transferred to the next in line. In case the current is not withdrawn from the first magnet, it will act as a brake, and tend to hold the ball stationary. Thus the speed may easily be regulated."

The engineer pressed a button, and the ball rolled with amazing rapidity to the other end of the trough.

"Because of the incompleteness of the model we have no real speed control," continued Verne, "but in actual operation the speed would be regulated by these sound reproducers and amplifiers."

Hardy was now thoroughly interested. "And what speed would that develop?" he asked.

"Well, I can't speak with certainty, but it would be approximately the speed of sound passing through air; that is, 1090 feet per second, or 764 miles per hour. At that rate it would take about four hours to cross the continent. You see," he continued, noting that Hardy looked impressed, "a certain sound or combination of sounds set in motion at one end of the route would be taken up by each of these amplifiers in turn, and relayed undiminished until it reached the other end."

"It's the same principle that we use in making sound waves actuate electric controls," put in Babcock, who was particularly expert in this field. "It is this method that has been employed in so many modern devices, such as the televox traffic signals, where the sound of a horn operates the traffic signals, and in other devices—some of which we are now using on our own lines."

"Yes, I know," Hardy agreed. "I don't suppose that we should encounter any insurmountable difficulties,

so far as that is concerned. But how about going over the mountain ranges? Wouldn't that take a tremendous amount of power?"

"I am no Napoleon," answered Verne, "but since he had the colossal conceit to say 'There shall be no Alps,' I think I may venture to say that there shall be no ups and downs on this line. I mean it literally. I would suggest an absolutely level course—some fill, but mostly cut."

Hardy hesitated, as though he had not heard right. Then he whistled significantly, and stood staring at Verne as though to reassure himself of the engineer's sanity. Then his eye wandered back to the model.

"How large did you say this ball would be?"

"I didn't say," answered Verne. "That is largely a matter of convenience. I had planned, tentatively, on a circumference of about a mile. That would give it a height of about 1680 feet. Two or three such spheres would settle our traffic problem for many years. We could always have two loading and one in transit."

"You want to build a sphere as tall as a skyscraper!" exclaimed Hardy. "If I didn't know you so well, I'd think you had gone crazy suddenly from overwork."

"My idea exactly," chimed in Babcock. "I think we could do nicely with a sphere only 500 feet high. That would give a circumference much less than the other—only about 1600 feet, or less. It would be much more practicable."

"If we're going to have it at all," snapped Verne heatedly, "we may as well have it on a large scale. And what's more," he added, turning upon Babcock, "I wish you'd keep out of this and let *me* do the talking. It happens to be my idea."

Babcock did not answer. This public rebuke was something he had not expected.

"The conveyance itself," continued the chief engineer, turning to Hardy, "offers some problems that we have not been able to work out fully as yet." He took up the ball and removed a large section of the shell. "In a general way, however, it seems possible to construct it after this model.

"These sections in the interior are compartments, fashioned somewhat after the manner of the segments of an orange, except that each original segment is made up of a number of sub-compartments, all parts of which are detachable and removable. These segments can be made identical in size and shape, and their subdivisions can be made into a series, so that those of one segment would fit in a like position in any other segment. For example, compartment five of one segment would be exactly like compartment five of another segment, six would be interchangeable with six, and so forth.

"Some commodities, of course, would have a tendency to shift and knock about in these compartments, and become damaged. But I think it is quite possible to work out a system of stabilizing most of the freight with compressed air, or with some kind of clamping devices."

"That's the least of it," said Hardy. "What I'm thinking of is the construction proposition." He took up the sphere and weighed it in his hand, apparently trying to conceive of the dimensions of a ball a mile in circumference. "All that excavating for a level cut is impossible, utterly impossible. Why, man, there isn't enough money in the world to finance an undertaking like that! I'm simply referring to the business end—the construction."

Great Plans

"YOU are right—so far as present methods of construction are concerned," replied Verne, unmoved. "Remember that the Panama Canal was deemed an impossibility after De Lesseps failed. That also was a work of construction and excavation—and far more complex than the task we may take upon ourselves."

"But consider the difference between cutting through a narrow strip of land and cutting a straight road across a continent. We may as well stop right here. There's no use in going on."

"You think so? What would you say if I told you I had already devised a plan for the construction of the passageway?"

"I'd say you were mad, and I'm beginning to think you *are* a trifle unbalanced on this subject. Put away this toy and forget about it."

"Do you think I would do that?" asked Verne, in a tone which made Hardy look at him suspiciously. "Here I've stumbled on something that would be a positive blessing to humanity, that would aid enormously in the progress of civilization. Think of the benefits to be derived when this principle is applied to a variety of uses! Think of what the amazingly rapid transportation would mean to industry—think what it would mean to this country in case of a war—and you know as well as I that we have never been so close to war in the past fifty years as we are now!"

"Well, what do you intend to do?"

"If you don't want this," said Verne with finality, "I'll go straight to Washington and offer it to the government—gratis. You'll probably have me fired, but I can always get a job. Here I have worked out for you the invention of a century, and you won't even let me finish telling you my plans for accomplishing it."

"You seem rather certain of yourself. Yet I know that you couldn't possibly do it, even with great improvements in the machinery we have now."

"Improvements is not the word," answered Verne. "We shall require nothing short of revolution in machinery and in methods. I have in mind a scheme partially developed which might amount to something. I would not attempt to use steam shovels, because even if we could build them ten times as large as they are now, they would be but toys compared with the magnitude of the job."

"Then what would you do?"

"I would do the work in two operations. First, I would have a machine that would dig the cut, throwing the soil in a pulverized state out into the trench behind itself, as the gray badger does when digging his burrow. This, in my opinion, could be advantageously accomplished with a machine modeled somewhat after the style of the present trench-digging machine. Then, a system of belt conveyors, unencumbered with heavy excavating units, could very easily carry this powdered soil out of the cut."

"It sounds all right," said Hardy, without the slightest appearance of enthusiasm. "I suppose there might be a possibility of great improvement that way; but even so—well, we will come back to that later. Now, where would you propose to locate this little system?" And he turned to a large, square, map of the United States that hung on the wall.

"Well," replied the engineer, apparently feeling that he was now on firmer ground, "there could be but one logical place." He took from his pocket a large rubber band and stretched it until it snapped. Then, stretching the length of elastic to arm's length, and reducing it to a mere thread in thickness, he held it against the map, one end passing through San Francisco and the other through New York.

"Here," he said, "are four of our livest and most populous cities in a perfectly straight line—San Francisco, Chicago, Cleveland, and New York."

Hardy looked amazed. He followed the line carefully with his eye. "I never thought of that before," he confessed. "A perfectly straight line would pass within the city limits of both those central cities, although that would not be necessary. By George!" he ejaculated, "I don't suppose anyone realizes that."

"For our purposes," said the engineer, "it is really a happy circumstance, for we must have a course absolutely straight if we are to attain the speed of sound."

"Wait a minute," said the financier, inspecting the map closely, "How about these two little sections of Lake Michigan and Lake Erie that come below the line? Bridging them would be an expensive job."

"Well, you see, bridges wouldn't be of much use, because our way will lie beneath their level. We would have to dike them off, and then make our cut."

"And after that," sneered Hardy, "I suppose you would pick the sun out of the sky and light your pipe with it. What you ought to do is to consult a nerve specialist. I said before, and I repeat it now, that you are going dotty."

"Yes," replied Verne. "People do get that way thinking about rapid transportation. One man, who is an old hand at the game, was talking to me seriously, not long ago, about a scheme to make daily trips across the continent."

They both laughed, and Babcock joined in their good-humored mirth.

"Verne," said Hardy, "I think your scheme is impossible—utterly impossible. But I suppose it can do no harm to try a little experiment. Now I think, just to convince you that you are wrong, that we could arrange to electrify one of our old, unused, roadbeds between a couple of small towns, say, twenty or thirty miles apart. These towns, as you know, are no more than names on the state road maps, and it doesn't pay us to keep up service. In that way we could make a practical test of the scheme, and get the ball to rolling on a small scale. In the meantime, you could see about developing the excavating—or rather super-excavating—machinery, such as you have described. Then, if we find it possible to do the impossible, we could start boring with a big auger."

As Verne and Babcock were leaving the office, Hardy motioned the chief engineer to remain behind. When the younger man had shut the door behind him, the president drew Verne into a corner.

"How much of your plans does Babcock know?" he asked.

"Why?"

"He's a good man, and all that, but I don't trust him very much. How do you know he won't sell this idea to another road?"

"Well, suppose he does? They haven't got the money we have, and they won't dare to try anything. Besides, we can have all my inventions patented, of course."

"Yes, but they can be on to us without imitating us. I didn't get where I am without making a smear of enemies, and if I know Kilpatrick, that old wolf would give ten—or anyway, five—years of *his* life to thwart me in the greatest project of *my* life."

"So that's why you pretended to believe my plan impossible."

"No. I still believe it's impossible. But get Babcock away on some other work. You don't need him for this, anyway. Remember that anyone with inside information can cause no end of trouble. Kilpatrick and his bunch could get franchises on little roads we want to buy up; they can obtain options on land we would have to own to cut through; they could stir up the press to ridicule us, and make us the butt of jokes all over the country; in fact, they could—and they would—do anything, short of murder, to keep this line from getting farther ahead of them than it is. Do you get the idea now?"

"Well," said Verne, "if this is big business, give me the forest primeval, where wolves don't go around disguised as railroad presidents."

CHAPTER III

A Conspiracy!

THE next morning, before Verne set to work to arrange preliminary details for the building of the experimental transportation system, he charged Babcock with a mission, seemingly important, concerning the inspection of the company's western lines. To make a complete report, embodying all the necessary mechanical information, would take months. Babcock understood perfectly well that he was regarded with suspicion in the east, and yet he had his reasons for wishing to go to the Pacific coast for a time. His sudden orders, therefore, he regarded more as a fortunate occurrence than as a hindrance.

Accordingly, while his chief slaved in the east to finish the construction of the dinkey line, Babcock enjoyed himself in a little city on the coast of Lower California, where, in the semi-tropical sunshine, he conferred daily with three urbane individuals on a subject which would have made the reputation of any secret service operative fortunate enough to discover it.

"My good friend," said the engineer, lighting a cigar and blowing out the match in a cloud of fragrant smoke, "why don't you allow me to conduct the campaign in my own way? Already I have enlisted the aid of Hardy's most powerful rivals. I can assure you that the Scarab line will never be completed; or if it is, that it will never be put into operation. When you attack

on the west coast, there will be no swift-moving sphere to carry great guns across the continent in four hours. When you destroy the cities on this beautiful coast"—he allowed a sigh to escape him—"you will arrive at a convenient time when the battle squadron is off somewhere in the Atlantic. When you establish your dominion over the western quarter of this opulent country, your millions will have a place to breathe in, to live in, to prosper in. . . ."

"Which they have not now," finished one of his companions. "It's really too bad," continued the other, whose nationality would be difficult to determine, "that we could not have come to a peaceful agreement on the matter; but then these statesmen are so pig-headed."

"And we will *not* destroy these beautiful cities of the Pacific coast, my dear Babcock," put in a man whose swarthiness might make him appear at first glance an Ethiopian, but whose features revealed the Oriental. "On the contrary, we will make use of them. Our people will move into ready-made homes—after our army evacuates them," he added, with an afterthought.

"Still," said the renegade engineer, "it may be better to terrify them by wholesale slaughter. I, for one, would not object very much—provided you spared a few women."

The four men laughed. "You will get that and the other things we promised," said one. "The day we enter Washington you get ten million dollars and become governor of the Eastern Seaboard."

"But then, it will be so easy," continued the first speaker. "With disarmament as it is now, we have little to fear."

"You forget," said Babcock, "the battle squadron."

"A mere gesture," said the dark man. "Our planes will wipe it off the face of the sea in an hour."

"But there are planes in this country as good as any of yours, and pilots, too. Of course," said the engineer, hastily, "I don't mean there is any possibility of their stopping you, once you have gained your ground, but they are always to be reckoned with. And then, not long ago, that dog Verne predicted with confidence that war was imminent. That was when he rebuked me before Hardy, the fool!" On Babcock's usually impassive face appeared a look of hatred which vanished almost as soon as it had formed.

"That's nothing. A mere personal affront. But it will be well to look into these preparations for war. Did Verne mention the use of his ball-transport in case of war?"

"Why, yes, he did. He was quite emphatic—mainly, I believe, in order to convince Hardy, who is as short-sighted as such men usually are. That was one reason why I suggested a smaller sphere—simply because I know Verne better than Hardy does. Let him build his scarab ball; we shall know how to copy it—before something happens to it!"

A Troubled World

HOW successful Verne was in building his experimental line and his trial sphere is a matter of scientific history, no less than a matter of world history. To the admiring public, Verne was the hero of the hour, in spite of the fact that the tests had been kept secret. Hardy had been right; Kilpatrick and his associates had stirred up the press, but the press, as usual, preferred to use its own discretion. Yet few knew what lay behind this first triumph of the great engineer. The public is usually informed that a scientist has struggled, suffered the tortures of hell, endured ridicule, triumphed over defeat after defeat, and emerged from his ordeal a changed man, a benefactor to humanity. In the case of Verne, this was not quite true—at first. His success, with the converted Hardy to aid him, was a matter of course. His real trial was to come later.

As soon as the first public acclaim had died down, Hardy set to work to organize a new company to finance the projected transcontinental line. The new organization was, as a matter of fact, simply a pooling of the resources of all the large units in the Universal Transportation Company, in order to accomplish what none of them could have hoped to accomplish alone.

Then began a campaign which, while it was strictly a business affair, began to play an important part in the economic life of the nation. People were asked to buy stock in the company. High-priced publicity experts spread everywhere the gospel of rapid transportation; newspapers were given heavy advertising contracts in return for cleverly worded columns of news publicity and editorial approval; the "class" magazines ran feature articles on the vast possibilities of the new transportation; radio hours were devoted to an explanation of the principles of the new invention; even conservative banking firms, which had invested in the new organization, became enthusiastic over the project, and sent high-powered advertising matter to their clients. Since the company had not completed its plans and was in no position to earn money, its stock was not traded on the exchanges; but there was a good deal of private stock-selling which demonstrated the intense interest aroused by what had once been the dream of a great engineer. In short, a nation which had taken twenty-five years to become "air-minded" took less than three years to become "scarab-minded." Such is the power of publicity and such man's faith in science.

The company became more than a business venture; it became a matter of national pride. The government displayed marked interest in the development of the transcontinental road, and offered its assistance. Agents of foreign powers tried desperately to buy the plans or to steal them. But for once Hardy was more the patriot than the man of business. While he realized the financial advantages of selling his rights to foreign countries, something stronger and deeper than his love of money held him back.

Both he and Verne had decided to keep the system confined to the United States—for some years, at least—and, moved by the same impulses, and realizing the value of allowing the invention to become more desirable as time went on, the board of directors sided with them. It was a curious patriotic fever, even as late as the nineteen seventies, which made these men determine to give their own country something which would set it apart and above the rest of the world.

Of all this Babcock was quite aware. While he had

been transferred to another division of the vast system, still retaining his title of assistant to Verne, he kept his fellow conspirators on the Pacific coast constantly informed of the latest developments. What they read in the newspapers was one thing; what was really taking place was another. Even Kilpatrick, who had lost all hope of ever imitating the vast project, still did his best to hinder the progress of the excavating and building. The diabolical cleverness of Babcock was nowhere more apparent than in his success with the rival of Hardy. He was assisting Kilpatrick to work against Hardy, and at the same time to work against himself—not knowing, of course, that the delay in the building of the sphere might mean a great deal in any international conflict to come.

The foreign powers, while still preserving a surface friendliness for the United States, regarded the refusal of the rights to the invention as a distinct international insult. Babcock and his agents discreetly encouraged this rising feeling. Emissaries of the conspirators, in close touch with the world's diplomats, openly discussed the obvious plan of the United States to rise superior to other nations by means of an epoch-making, a tremendous, advance in the science of transportation. The result of all this maneuvering was precisely what Babcock desired. The other nations of the world could be counted upon not to interfere when the United States was attacked. This country, with only a small standing army, and the ghost of a navy, with an air force no larger than that of a second-rate nation, would be left isolated long enough for the invaders to accomplish their purposes. After that the complete subjugation of the richest country on earth would not be a matter of extraordinary difficulty.

The world was prepared for the change. Sick with envy and jealousy, the other great powers, unless their own interests were in danger, would not send a man or a gun or a ship to aid the greatest nation in the western hemisphere.

Verne's new excavating system, after a preliminary trial, and with the addition of several improvements, had amazed even Hardy. Either invention alone would have been enough to give undying fame to its creator; Verne had the distinction of having created the rolling ball method of transportation and of having devised an engineering system to make it possible. Hardy, shining in reflected glory, assumed credit for having set off the train of thought which brought about this revolution in transportation.

CHAPTER IV

Ready to Start

NOT many believed that the greatest engineering feat attempted could be completed in ten years. Yet, as the end of Verne's task approached, public interest, which had died down somewhat after the first flush of enthusiasm, began to boil once more. The United States was about to demonstrate its position as the greatest nation in the world.

But in those ten years Babcock and his fellow-conspirators had not been idle. Little by little, in spite of the strict immigration laws, the Pacific coast had been converted into a stronghold of enemies. They were smuggled in from Canada and Mexico; they slipped ashore from incoming ships among the quays of San Francisco; they posed as laborers in Lower California, passed into California, and concentrated in her most important centers.

The great terminal of the Scarab line, already built, was one of the show places on the outskirts of San Francisco. Occupying a square mile of level territory just outside the city, it enclosed at one end the largest power generating station in the west. Stretching in a perfectly straight line across the magnificently planned field, and extending to the horizon in a northeasterly direction, was what appeared to be a runway of brilliant metal, which gleamed with an intolerable radiance under the California sun. Millions had been poured into the construction of this broad belt. On either side, for nearly an eighth of a mile, extended the level ground, bounded by elevated rails of extraordinary thickness, which ran parallel to the runway. At regular intervals along the route, and set directly next to huge electromagnets placed beneath the metal band that seemed to span the earth, were sound amplifiers and reproducers. These were of little more than ordinary size, but of such sensitiveness and strength that the most perfectly built instruments of their kind which existed in the first half of the century seemed like toys in comparison with them. Most people had only a vague idea of what these were for; the workers whom Babcock had managed to get on the payroll of the company knew even less about them: What these men did know was that they were to hold themselves in readiness to destroy them.

By the end of 1979 Verne had completed his great sphere. It stood in its terminal in New York, on what had been an airport: An incredible, monstrous creation, looking like a miniature moon which had fallen upon the earth. On its vast surface an entire sector seemed to have been cut away, and derricks had been drawn to the opening, ready for loading. The interior of the sphere, spacious as a cathedral, was illuminated with innumerable jets of cold light. Privileged visitors were allowed to climb inside, and to observe the compartments, all identical, with their freight elevators, their compressed air stabilizers, their spiral staircases, and their adjustable freight spaces.

Those who imagined that the terrific rotation of the sphere would draw chaos from order inside the ball were reassured by the powerful electromagnets *inside* the immense shell, which, charged from the belt upon which the sphere was to ride, would hold the metal-cased freight securely against the sides of the monster, or along the steel partitions. It was even rumored that Verne was contemplating a passenger sphere, in which an interior shell, stabilized by gyroscopes, would not rotate with the outer surface. This, however, could not be confirmed.

The electromagnets along the three-thousand mile path of the sphere were to be actuated by the spoken word "scarab," according to the newspapers; and the announcement, made on June 4th, scheduled the first run for a month later, on the celebration of Independence Day, 1980.

Babcock, reading the announcement, laughed aloud. By that time, if his plans succeeded—and there was no reason why they should fail—the words "American independence" would be the laughing-stock of the world.

Threats of War!

IN order to avert any possible suspicion, Babcock was to be in New York at the time of the attack, and he had promised himself the pleasure of ruining the Scarab Transportation Company with his own hands. Several hundred thousand yellow-skinned and brown-skinned men, fanatical in their hatred for the United States, were already stationed at strategic points in California. The opening of the line provided an excuse for their massed numbers. Yet each had his part to play in a vast scheme of conquest.

Behind the walls of dingy shacks no one could guess what deadly machine guns were hidden; in the underground caverns dug beneath abandoned houses and in the private homes of a few rich conspirators no one would imagine arsenals capable of wiping out a city. Directly across the Canadian and Mexican borders were massed great amphibian planes which could be converted into bombers at a moment's notice; and the airports of California, Oregon, and Washington contained any number of pleasure craft and business planes which, with their automatic stabilizers, their super-charged motors, and their radio control, were potential and deadly engines of war. The government flying fields on the vast plains of Texas were to be the central strategic points for the subjugation of the southwest.

Transpacific airplanes and dirigibles had brought deadly cordite bombs across the ocean to their haven. In the mountains that ran down the center of California; in the high ranges of the Sierra Nevada, were established chemical plants for the reduction of metal-bearing ores; and government inspectors had failed to remark how well equipped these plants were for the production of poison gases. Four thousand miles from the coast of California a vast armada prepared to steam slowly eastward. When the Pacific ports had been captured, an army could be landed within a week.

The American newspaper correspondents were informed that the concentration of the Asiatic battle fleet was simply for the purpose of maneuvering in the mid-Pacific. Washington, however, became suspicious when hundreds of great submarines, capable of crossing the ocean as fast as any destroyer, were sent at intervals to accompany the fleet. Verne, talking to Babcock in New York, mentioned casually that his immense sphere was quite fitted for the transportation of coast-defense guns.

"Simply remove some of the sections," he said, "and you have an ideal ordnance transportation system. We're loading several hundred small planes as part of the first shipment. The army is going to increase its aviation activities on the coast. Why, I don't know. Maybe they're afraid of an invasion."

"Invasion! That's a good one," laughed Babcock. "The Pacific coast is as safe as it was three hundred years ago. Who could attack across four thousand miles of ocean?"

"Still, I wonder," said Verne. "Things aren't what they should be. I don't like this fleet moving toward us. It may not mean anything, but I wish our own battle squadron were somewhere around there. Nothing like a little protection, you know."

"War is impossible," answered his assistant dogmatically. "This may be a quotation from our leading statesmen, but it's true, nevertheless."

"I feel as though we were sitting on a powder barrel," answered his superior. He turned the knob of the radio receiver which was always tuned to the news broadcasts, and caught the announcer in the middle of an utterance.

". . . and a fleet greater than any ever before assembled is performing maneuvers in the Pacific," the voice was saying. And then, after a moment or two: "We have just received word of a slight explosion in the terminal of the Scarab Transportation Company at San Francisco."

"What!" cried Verne, leaping from his chair.

"Too soon!" slipped from Babcock, who bit his lips a moment later.

"What did you say?" asked Verne, who had heard perfectly well.

"I said 'So soon?'" replied Babcock. "It's a wonder it hasn't happened before, with the ignorance of those imported laborers."

Verne did not reply, but endeavored to get a long-distance connection on his television apparatus. Presently he was speaking to the agitated manager of the western terminal.

"It's not serious," reported the man in San Francisco, attempting to smile. "A few of the amplifier connections have been destroyed. We have not yet ascertained the exact extent of the damage."

"What was the cause of it?"

"We aren't sure, but we think it was carelessness."

"You do, eh? Well, repair that damage at once, and see how far it extends. Examine every inch of that line for twenty miles out of the terminal. Understand? And call upon the state for a military guard. We aren't taking any more chances! Something tells me such accidents don't happen by themselves—not with what I know of my own system!"

"Do you really think a military guard is necessary?" asked Babcock, in an off-hand manner, when Verne had severed the connection. "I think you're taking a lot of trouble for nothing."

"Ten years of labor isn't nothing," snapped Verne. "How do I know it isn't Kilpatrick up to something?"

"Oh, I'm sure it isn't. When the ball goes through on July Fourth," he added, with a curious smile, "you'll see your suspicions had no foundation."

What Verne Saw

VERNE walked from the room without replying. He had suspected Babcock all along, and now he was certain of something. Babcock, he thought, was in league with Kilpatrick. Then he acted with his customary decision. He gave orders to his private detectives to have his assistant watched; and meanwhile he took the precaution of tapping the wire from Babcock's office, although he expected to learn nothing from

that source.

On the evening of the twenty-ninth of June Verne received a report that Babcock had been in constant communication with San Francisco; that he had made several calls; and that his operatives had succeeded in tapping the last. Babcock seemed to be worried about the progress of some affair of his own in California, Verne was informed, although from the words used it was impossible to determine what it was. The most enlightening of his sentences was "Don't wait any longer; use the runway!"

Verne went home, undecided what to do next. His radio television apparatus, which for a week past he had concentrated exclusively upon the San Francisco terminal, gave him what amounted to a talking picture of what went on in the vast enclosure. It was not necessary for anyone to broadcast, as it had been fifty years before. One of his own devices, set high up on the wall of the terminal, gave him something of a bird's-eye view. Very few knew of its existence.

Through the radio came what sounded like the noise of a struggle. It was ten o'clock in the evening in New York, and consequently seven on the coast. The workmen had departed. What, then, could this mean?

Then he saw! As though a veil had been ripped from before his eyes, he realized the meaning of it all—he saw the watchmen lying apparently brutally murdered! This was no robbery. This was a conspiracy! And then, as he watched, his face pale, his heart pounding, the work of his life at stake, he saw men in uniform—a uniform strange to him—pouring from a tunnel which opened into the terminal, of the very existence of which he had been ignorant.

Without confusion, and with perfect military precision, they formed into platoons, in squads of sixteen, eight abreast. There were commands in a tongue he recognized, with a sickening sensation. The soldiers, each armed with a heavy automatic pistol of the silent type, each fourth man carrying a small machine gun, began to march down the runway—his own runway, upon which his scarab sphere was to cross the continent.

Fascinated, a cold fear gripping him, he watched. This was not the work of Kilpatrick. These men were no ordinary ruffians. He noted, with a wave of something like relief, that they damaged no equipment. Apparently they had some use for it, then. He moved the focussing equipment a trifle. Into the great entrance of the terminal, which was now in view, rolled a closed car. An officer ran up and saluted the man who descended from it—apparently the commanding officer. There was a slight delay, and some hesitation; then the chief got back into his car. His chauffeur drove him to the head of the column. The march proceeded.

Verne though he had gone mad and was the victim of hallucinations. What earthly use would it be for men to march on his runway? Then, like an inspiration, the words of Babcock came back to him: "Don't wait any longer; use the runway."

The engineer knit his brows and centered his brilliant mind on the problem before him. Then, as though moved by springs, he leaped to the telephone and called the War Department in Washington.

To the subordinate who answered, he almost shouted: "Get me the Commander-in-Chief! Quick! This is Benjamin Verne, of New York!"

"Sorry, sir. The President is on his yacht."

"I don't want the President! I want your commanding officer, chief of staff, whatever you call him! This is a matter of saving the country!"

"He isn't here, sir," answered the young officer, who apparently thought he was dealing with a madman. "I am here only for emergency. General Winfield is at a social function."

"He would be!" ejaculated the engineer. "Will you call him at once and tell him to call me at once? This is–imperative!" He gave his number.

"I'll try," promised the young man.

Verne cursed aloud.

CHAPTER V

Drastic Action

TEN minutes later—minutes during which he looked at the television screen in agony and realized only too well what was taking place—his telephone rang. The distinguished head of General Winfield appeared in the screen, surmounting a stiff white collar and appearing to grow from a radiant shirt front. The general in evening dress was not as imposing as the general in uniform.

"Listen, General," said Verne, casting formality to the winds, "you must rush every available man to California at once—tonight! The country is threatened with invasion; the maneuvers of the fleet in the Pacific are a blind, an army is crossing the ocean to attack us on the Pacific coast."

"Impossible, sir! Have you gone mad?" The general's great respect for Verne as an inventor did not include respect for his military knowledge.

"I tell you we are being attacked! I have been watching my private television screen. Several companies of foreign soldiers have come through a secret tunnel and taken possession of the San Francisco terminal of my Scarab line; they are now marching steadily down the runway! The watchmen have been murdered! Are you going to sit there and listen to the music while a military invasion is being carried out?"

"What are you telling me?" demanded the general. "Why should anyone wish to march down your runway?"

Verne almost cursed the general aloud. "Don't you see," he cried, "the advantage of that? They have a perfectly safe and level route to follow; they know just where it is taking them; they are hidden from view; they can stop wherever they wish and attack wherever they choose; they are armed with machine guns and—he glanced at the screen again—"with field pieces! They have swift trucks for the guns. Every man has a gas mask at his belt—ready for instant use. Does *that* mean anything to you?"

"By gad!" exclaimed General Winfield. "I wouldn't have thought it possible that they could do all this and escape our detection!"

"That's because we've been too sure of ourselves; we've reduced our army and navy; we've laid ourselves

open to attack. I don't blame these Orientals! They're stifling for room to breathe and we don't let them in; I'd do it myself if I were in their place and saw a rich and pleasant country lying ready for the taking. Now do you understand why I've been suspicious all this time? Do you see any relation between the large fleet in the Pacific and this attack on San Francisco? I suspect it was all accomplished through inside work. I think I know just who's responsible for all this. But in the meantime, what are you going to do?"

The engineer's face, in the general's television screen, was distorted with mental anguish. Verne feared the loss of his invention and his life-work more than he feared this invasion; the one could be repelled; the other, once destroyed, could never be replaced.

General Winfield hesitated a moment. Apparently he was convinced. Then his measured, deliberate tones took on a parade-ground quality.

"We must depend upon our aviators to observe and to stop this fleet," he said. "We must destroy every vessel approaching. I will confer immediately with the Secretaries of War and the Navy who are empowered to act in the absence of the President and while Congress is not in session. Otherwise, I take the responsibility myself, and I know Admiral Clark will support me. Unfortunately our own fleet is too far away to be of any use; and besides, it's too small. We must depend upon army bombers and upon navy seaplanes. But unfortunately we have very few in California. We were awaiting the shipment to be made by your Scarab express. The nearest large field is at Kelley Field, Texas. I will telephone there immediately."

"What can I do?" asked Verne.

"You can send those planes in your sphere before we bomb the runway," answered the general.

"Oh, my God! Don't destroy the runway! It's the pride of the nation; the world's greatest engineering feat!"

"I'm afraid we may have to do so! Undoubtedly the enemy has a large number of planes already on the way to attack. This concerted invasion by land, sea, and air is too sudden to admit of any but the most drastic measures. Our planes must fight the invading planes, and they must destroy the enemy fleet. A large assignment!"

"Can you have a regiment at the terminal to unload the Scarab and to repulse any armed force that tries to prevent them from doing so?"

"I can and I will," said the general, once more the man of action. "Colonel Ardsley's regiment can get there in time; I will order every available aviator to report to San Francisco at once. How soon will the sphere arrive?"

Just in Time!

I CAN have the power turned on at once. Let's see—it's ten-thirty now; that's seven-thirty on the coast; expect the sphere by twelve o'clock, Pacific time; and if you hear the word 'Scarab' from the amplifiers, and the ball has not appeared, don't wait for it, for it won't come—it will probably have been mined." Verne almost sobbed, but he was a man of steel and ice when the occasion required. "I will telephone my assistants on the coast to give you every aid. They know the technical side of the thing."

"Lucky you saw all this," said the general, preparing to ring off. "What are they doing now?"

Verne looked at the screen again. "They are still coming from the tunnel. I don't know how it was ever built without my getting wind of it. This is Babcock's work. . . ."

"What?"

"Never mind! They haven't been discovered as yet! I think they mean to open the ports to the fleet. If we wipe them out, we can still have the advantage. Have we any coast defense guns on the Pacific?"

"Not one," groaned the commander. "Can you send us some?"

"No," said Verne, with a smile of desperation. "But if the sphere ever reaches the coast, have it unloaded and sent back at once. I—I may have an idea."

Ten minutes later, Verne, having telephoned his instructions to his own men, caught up a silent Colt and dashed out to his car. Over the uncongested roads that led out of New York he tore silently at more than a hundred miles an hour. From a distance he could distinguish the vast bulk of his creation, which appeared to rise before him suddenly and blot out everything else.

The Scarab was loaded with battle planes, which could be assembled very quickly, in addition to other freight. The engineer stopped at the power-house and ran in.

"Was anyone here?" he panted to the night engineer.

"Mr. Babcock, sir. He's in the yards right now. Said he had orders to take a look around."

"Listen!" said Verne. "I have telephoned every power-house along the line to put on the juice. Now you do the same. I'm going out to the yards to start the Scarab; and—if I don't come back, and she doesn't start, come for my body and start her yourself! Understand?"

"But—but—"

"But—but—"

Verne did not hear him. But he heard the low, deep hum of the dynamos. In the faint moonlight the great sphere threw a black and almost impenetrable shadow.

The engineer advanced into the gloom. Grasping his pistol, he walked toward the starting switch and the sound reproducer. A shadow seemed to detach itself from the gloom and glide away. "Babcock!" shouted Verne.

There was no answer. Perhaps his eyes had deceived him. His breath coming in gasps, he ran at full speed toward the switch, his long legs carrying him with incredible swiftness for a man of his age. As Verne approached the switch the figure of Babcock straightened up. In the younger man's hand glittered a heavy wire cutter which he dropped to snatch up a pistol. "Babcock!" gasped Verne.

"Glad I came here," said the other, endeavoring to conceal his weapon. "I found the ground wires cut, and somebody's been fooling with the sound mechanism."

"You—you—" sputtered his chief.

"Too late!" laughed Babcock, triumphantly, and without a moment's hesitation he raised his right hand and pulled the trigger of his pistol.

There was a faint hiss. Verne felt as though a weight of many tons had struck him in the left shoulder. He spun around and almost fell; then he clutched his own weapon with his right hand, and, turning around again to simulate the contortion of a dying man, he fired from the hip. Without a sound Babcock plunged forward on his face and lay still.

"I wish I could have saved you for something worse, you rat!" muttered Verne, between his teeth.

He attempted to walk to the switch and fell, almost beside it. Supporting himself on his right arm, he raised his head and shouted "Scarab." There was no response. The vast sphere did not move; its band of glittering metal shone in the moonlight as before; the great ball remained, apparently as immovable as Gibraltar.

Verne attempted to call to the man in the powerhouse, but his voice failed him. Beneath his hand he felt the severed strands of the heavy wire Babcock had cut. His left arm was numb. His right hand guided his left hand to the wire; he seized the ends and leaned his entire weight upon his hands, in a desperate attempt to unite the strands. He stretched forth his neck. His dry lips opened. The faintest whisper came through them. "Scarab!"

There was a sudden rush of wind. Verne realized that a vast bulk had disappeared. The moonlight now fell upon him unobstructed. And, lying on the ground, his hands on the two ends of the wire, Verne saw the enormous sphere diminish as quickly as a punctured balloon. From the rails came a clear, ringing sound. "I must hold these ends until she passes the next powerhouse," he gritted, between set teeth.

When the station attendants came to the switch, a few moments later, they found the Scarab vanished; Babcock dead, with a bullet through the heart; and Verne almost unconscious, his cold hands holding together the ends of a severed wire with a grip as stony as that of death.

CHAPTER VI

Thundering Westward!

WATCHERS in lonely districts that night were struck dumb by the apparition of a monstrous, ghostly sphere that hurled itself through the darkness with incredible velocity, with a roaring of wind like that of a tornado. Guards patrolling the runway shrank to one side as a loud, metallic sound came down the magnetic belt. Then, as they sought for the cause of it, a vast body loomed suddenly out of the darkness, and carried them off their feet with the rush of its wind. And they heard the amplifiers droning "Scarab—scarab—scarab." Night mail flyers between New York and Cleveland looked down in amazement at a giant object almost directly beneath them which drew away from them as the hare from the tortoise. One plane, caught in the wash of the whirling sphere, was drawn forward into the vast vacuum with such speed that the sudden acceleration made the pilot lose consciousness for a moment.

Like the earth in its orbit, whirling on its axis as it advanced, the huge sphere, higher than the tallest skyscrapers, longer than the greatest ocean liners, fled toward its Cleveland terminal. People sitting on porches overlooking the perfectly flat lands of Ohio sensed something like a celestial body streaking across the horizon. Already the rail was humming in Cleveland with the approach of the monster. The noise of the clash of metal on metal traveled ahead fifteen times as fast as the word "Scarab" could be transmitted from one reproducer to another.*

Expectant workmen at the first westbound station strained their eyes eastward. Suddenly, a trifle more than half an hour after the time the Scarab had left New York, the glittering magnetic belt, stretching as far as the horizon, seemed to gather itself and leap upward. A second later it appeared as though the broad track, shining in the moonlight, were being wound around an enormous drum at a terrific speed. Then, as the Scarab drew near, the optical illusion gave way to realization that the rising track was only the magnetic band around the sphere itself. Yet even as the station superintendent and his engineers watched in fascination, the sphere seemed to gather itself and leap toward them. As it whirled past their observation platform, a rousing cheer went up from the little group of watchers. A great upward rush of wind almost swept them from their places; then the inward draft almost pulled them off their perch. Before they recovered themselves, the enormous ball had become a mere round dot in the west, which diminished rapidly and faded from sight.

Two minutes later the Cleveland engineer spoke to the wounded Verne as they stood face to face across the television. "The Scarab has just passed through here," he reported, "and from the way she was going, you could shut off the juice and she'd broad-jump to Frisco!"

Verne managed to smile. "Examine the runway and report to me," he said. "I want to know how it stood the strain." In spite of the fact that he had gone over every inch of the magnetic belt with his own eyes, Verne had his doubts concerning the strength of the roadbed. A weight of thousands of tons concentrated even for a fraction of a second into one small area might cause a decided bend. But nothing of the sort occurred. Certainly his construction of the transcontinental line was the greatest engineering feat of all time.

Even as the sphere raced toward Chicago, Colonel Ardsley's regiment was racing toward the city of the Golden Gate. Already two observation planes had started westward across the Pacific to ascertain the actions of the approaching fleet. At the general's personal order, every airport was to be under the command of an aviation officer; every plane was commandeered and equipped for battle. By this swift stroke the conspirators lost the use of the planes they had prepared for the attack; and they themselves pro-

* Sound travels fifteen times faster in steel than it does in air.

vided the machines which would be used against their own fleet.

"Scarab—Scarab—Scarab" intoned the reproducers. Verne, lying with closed eyes, was following every mile covered by his hurtling giant. It was a hundred miles less from Cleveland to Chicago than from New York to Cleveland; he would receive his report sooner. He had eight minutes less to wait.

The test would come at Lake Michigan. Would the immense dikes withstand the terrific vibration? Would the waters of the inland ocean close over the gap created by impious man? In his tortured, fever-drawn fancy Verne could already hear those waters rumbling over his heart and brain. Would the dike be mined? Babcock! Why hadn't he had him watched sooner?

Then came the comforting thought that, no matter how much of a renegade Babcock might have been, he was too good an engineer to destroy a great work of engineering. But his accomplices might have done it. . . .

Nearing the Coast!

VERNE started at his television screen with unseeing eyes. Across the flickering sheet marched no armed men; he saw only a glittering mass of metal, like a ball from some fantastic cannon, shooting across the northern sections of Ohio and Indiana. Every five seconds it approached a mile nearer that fatal thirty-mile cut through Lake Michigan. . . .

The little group of white-faced men in Verne's room felt the swelling of a magnificent pride in their achievement. No matter what might happen at the end of the trip, they had shown the world what American engineering genius could do.

"I wish we'd have let these damned Orientals in," said Hardy, earnestly, if ungrammatically, as he mopped his brow. "If they do anything to my Scarab I'll—I'll tear them apart, one by one, with my bare hands!"

"I hope it runs them over!" exclaimed a newspaper man, to whom the invasion was still a joke. "Did you say they were marching down the runway?"

"Shut up!" snapped Hardy. "Can't you leave a sick man in peace?"

The telephone whirred. "Well?" said Verne.

A jubilant face appeared in the screen. "Somebody said 'Scarab' and there she was! Congratulations! Chicago has had the biggest thrill of its checkered career!"

"The dikes—did they hold?"

"They haven't changed any since yesterday," reported the western engineer. "All I want to say is that the Windy City has become twice as windy since she went through. What a breeze!"

"Gentlemen," said Verne, "it's 1855 miles from Chicago to San Francisco as the crow flies. That means we'll see the Scarab arrive"—he waved his hand at his private television screen—"in two hours and a quarter, or a trifle more. If we don't heaven help us all!"

If it was a terrific strain to the others, it was absolute torture, mental and physical, for Verne. "Illinois, Iowa, Nebraska, Colorado, Utah, Nevada—California!" he repeated. "I won't live till she crosses all that territory!" His shoulder was throbbing fearfully. A lesser man might have forgotten everything else in the agony of a shattered shoulder blade. Verne was one of those granite, thinking machines who go down in history as the men who snatch victory from defeat.

Over the flower-dotted prairies, crossed first by the ox-cart, then the pony express, then the railroad, then the airplane, past populous towns that had had their beginnings in the days of the first white settlers, through vast level stretches of territory still undeveloped, roared the glittering, globed expression of man's genius. Through the grain center of the nation, westward to the cattle and mining states, onward, onward, to the coast! It is difficult, now that Scarab transportation has become part of everyday life, to describe adequately that first epochal trip!

Under the star-studded sky, gleaming pale in the moonlight, cutting a coruscating path across a dark continent, like a comet across the black heavens, flew a senseless mass of metal that had been set off on its journey by a word and a touch. As though it were repeating its own name in a frenzy of speed, shouting it aloud in its victory, it seemed to shriek "Scarab—Scarab—Scarab!" as it plunged onward. An observer from another planet, able to keep pace with this meteoric monster, might have imagined it was fleeing from a word which followed it like a shadow, or was attempting to overtake a mocking, murmuring phantom which fled before it.

CHAPTER VII

The Great Massacre!

AND then the incredible happened. Looking back on it, sober historians have attributed to destiny what no man would have dreamt of doing.

Twenty miles out of San Francisco, the regiments of invaders, marching securely along in the runway, became suddenly aware of a ringing in their ears and a quivering beneath their feet. Trained officers thought of another California earthquake; marching men assumed the tramp of their own feet was shaking the roadbed. The Commander-in-Chief, secure in his pneumatic-tired car, heard and felt nothing. His mind was on the first attack. With the dawn the gas would come down from the mountains; the airplanes would fly down from Canada and up from Lower California; the ostensibly private machines in the coastal states would terrify their own cities. . . .

He got no farther. A wild scream of fear cut short his train of thought. Looking back, he saw his trained soldiers attempting to scatter to the sides of the runway, abandoning field pieces, trucks, and equipment. Some sank down in their tracks and called upon their gods. Some remained frozen in their tracks, staring with eyes starting from their heads above and before them. Some turned and ran, wildly, anywhere, gibbering like madmen. The commander endeavored to look from the window of his car. His chauffeur leaped out and scurried for the side of the cut. And then—

"Scarab, Scarab, Scarab!" A voice rose, triumphant, exulting. But the commander never heard it. The last sound he heard on earth was the horrible crunching of his automobile as a tremendous weight descended

upon it, and passed, leaving it a heap of dust, and him a broken mass.

Like a wall rising before the eyes of the invaders, like the spirit of the outraged nation, a vast bulk had loomed suddenly out of the darkness and towered above the army for a frightful second. Inexorable as the Kismet of the Mohammedans, more frightful than the fabled dragons of the Chinese, a million times more terrible than the Juggernaut of the Ganges, thousands upon thousands of tons of metal, rushing and whirling at deadly speed, descended upon a mass of helpless men. More monstrous than any weapon they could conceive of, this messenger of peace crushed the life from a thousand men at every revolution. Bodies smeared over its polished exterior were flung high into the air by the terrific surface speed. Like the feet of the wine maidens who crush the grapes for their delicious blood, the metal monster swished through an ocean of spouting gore that daubed its glittering sides and shot away in every direction, like the foam of a breaking wave. Men, trucks, field guns were demolished, crushed, pulverized, like flies, like bits of wood and tin, like the shapes in a nightmare that vanish in some incredible fashion.

The horror of it all lay in the terrible swiftness with which this wholesale slaughter was brought about. In five seconds the onrushing Nemesis had wiped out an army, leaving a handful of raving maniacs who had witnessed the destruction. Then, to the accompaniment of its fiendishly shrilling "Scarab—Scarab—Scarab!" that smote upon their ears like the diabolical laugh of their own evil spirits, the great insensate sphere shot away and diminished in the distance, exactly as though nothing had happened.

Less than ten minutes later Verne and his associates saw the empty terminal fill with panting, sweating soldiers in the uniform of the United States. Colonel Ardsley's regiment had, fortunately for itself, arrived too late to follow the invaders. In another moment a loud, grating, clashing noise, as of metal on metal, came from the screen. Then the vast bulk of the Scarab filled the terminal, blotting out everything else from view, and, with a harsh shriek, came to rest as the power was reversed.

"I would think the momentum would carry it right into the Pacific!" said the newspaper man.

"That's because you don't know anything of electromechanics," said Hardy, loftily. Then he looked more closely at the screen. A group of men was approaching the sphere: mechanics, who knew how to open it for unloading. And then he suddenly stiffened and stared.

"My God!" he shouted, "it's covered with blood! Look!"

Even in the half-tone effect presented on the screen great scarlet stains were visible. It was as though the Scarab had run through a great pond of dark-colored water, which had clung to its surface and was running down in little rivulets. But this was no water.

"It *is* blood!" exclaimed the reporter. "What did I say about running over an army? And there's a hand mashed on it, like a fly on a wall—there's something that looks like a piece of uniform! Verne! Your Scarab has wiped out any number of them! The fools! They marched in the runway!" And he burst into hysterical laughter.

Hardy and the others turned to Verne, to felicitate him on the first great run of the Scarab. But Verne had fainted! He had seen the arrival of his sphere, and the shock of the great wave of gladness that had swept over him had reduced him to unconsciousness.

America Triumphant!

HOW the invasion was put down in an amazingly short time is common knowledge. The two observation planes sent out at night had sighted the fleet just after dawn. One had been brought down at once by anti-aircraft fire; the other radioed the news just before it was struck. From the aircraft carriers of the fleet rose a flock of battle planes, which headed east. But they were no match for the vast squadrons that came to meet them. Every plane in the Scarab was manned by a pilot and gunner, some of whom had been sent all the way from Texas, others of whom had flown in mail planes from the east. Every armed airplane prepared by the invaders was turned to excellent use. When the attacking planes fled back to their carriers, they were pursued by fighters and bombers, who mixed with them in innumerable dog fights to keep the ships from using their anti-aircraft guns. Then, one by one, the expert bombers of the American forces disabled the swift destroyers, which dodged and twisted beneath them; blew away the superstructures of the great fighting ships and dropped depth charges near the submarines that accounted for many of them.

The factories designed by the enemy to manufacture poison gases began to pour forth vapors of greenish, floating poison at dawn, as they had arranged. Little towns nearby were decimated; the gases floated down over the valleys and wiped out all life as they settled. But in two hours the student flyers of the California flying schools, volunteering in the absence of the regular pilots, swooped over the plants and joyously blew them to pieces.

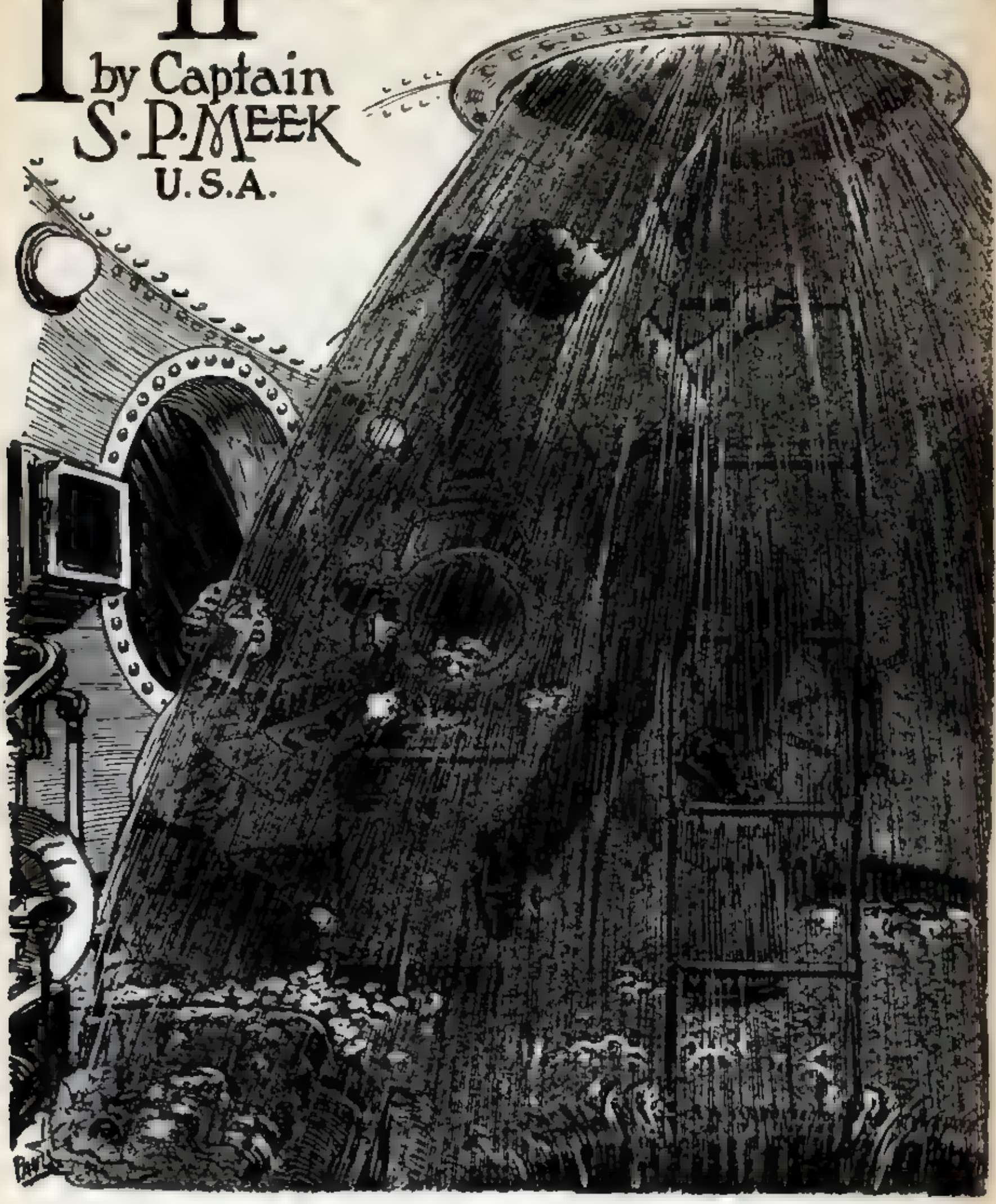
With the destruction of the main column which had advanced down the runway, the internal conspiracy collapsed as the tentacles of an octopus relax when the head has been severed. Not receiving the co-operation they awaited, and still ignorant of what had happened, the owners of the private planes tried frantically to get in touch with Babcock. But Babcock was beyond all calling. When, finally, they determined to get their planes and join the attacking squadrons from Canada and Mexico, they found their machines had been commandeered. Martial law in California made the slightest suspicious movement unwise; their numbers were not great enough to risk a concerted attack upon the regiments which guarded the airports; moreover, their leaders themselves had experienced a sudden loss of morale.

The most serious problem that faced the nation, therefore, was that of the planes in Canada and Mexico. Whatever other uprisings might take place could be put down by the state militia forces. Already the secret service, acting on the telephone calls made to Babcock, had tracked down the remaining leaders of the conspiracy. The United States, it seemed, was not so

(Continued on page 76)

Trapped in the Depths

by Captain
S. P. MEEK
U.S.A.



(Illustration by Paul)

The boat rocked for a moment and Jean was drenched in a downrush of water. Jimmy bounded to his feet and fought his way to the hatch cover.

By the Author of "The Osmotic Theorem"

OULD you like to take a trip under the surface, Jean? It will take only a few minutes to submerge."

They were standing in the control room. The hatch was open and above was a round patch of sunny blue sky.

Jean Gilmer looked around the room a trifle fearfully.

"Are you sure it's safe, Jimmy?" she asked.

"As safe as staying on the surface," replied Jimmy Dale with a laugh. "The *Loon* was especially designed for safety, and one man can handle her. Mac and I can take you thirty feet under and back in five minutes, if you'd like to go."

"I'd love to, Jimmy, but I'm afraid. Are you *sure* it's safe?"

"We'll leave that to Mac. He's a canny Scot and will err on the side of conservatism rather than recklessness. Oh, Mac! Come forward a minute, will you?"

MacPherson, Dale's engineer, came forward, wiping his hands on a piece of waste.

"Ye'll be calling me, Mr. Dale?" he asked.

"Yes, I was. Miss Gilmer, this is Angus MacPherson, the canniest Scot and the best engineer that ever came out of Edinborough. Mac, this is my fiancée, Miss Gilmer."

MacPherson wiped his hands again, inspected them carefully and then contented himself with a deep bow. Jean Gilmer laughed and reaching out, took forcible possession of the engineer's hand and shook it warmly.

"Mr. Dale has talked about you so much that I feel just as if I'd known you for years, Mr. MacPherson," she said. "We find that we need some advice and we've decided to ask you for it."

"I'm no Dorothy Dix to be giving advice to the lovelorn," replied the engineer cautiously.

Jean laughed with delight.

"He's cautious enough to suit even me, Jimmy," she said. "It's not that, Mr. MacPherson, it's something you'll be able to express an opinion on. Mr. Dale has offered to take the boat under the water and I'm crazy to go but I'm afraid to. I want to know whether you think it's perfectly safe."

"Well, Miss Gilmer, I don't know that I would say that much. There's an element of risk in all boats, although I think they're safer than New York streets. However, if it will ease your mind any, I'd say that taking a dive in the *Loon* was about as safe as crossing the Hudson River on a ferry boat."

"I'll take that big a chance," laughed Jean. "All right, Jimmy, let's go down into the 'darkness and the depths.' But tell me first how you do it, won't you, please?"

"Surely. All we have to do is to shut the hatch to keep the water out, fill our diving tanks, set our diving flippers to send us down and then go full speed ahead. When we have both our diving tanks filled we still have about two hundred pounds of excess buoyancy and we can't sink, although everything but our conning tower will be under water. To dive, we incline two flippers, or fins, that stick out on our sides at the stern end of the boat and start our propeller going. The pressure of the water on our diving flippers will send us right under. When we want to come up we just tilt the flippers the other way and keep going ahead and up we come. When we get to the surface, we blow the water out of our diving tanks with compressed air and the whole upper third of the boat comes up out of the water as it is now."

CAPTAIN S. P. MEEK, U. S. A.

"We'll have to fill the auxiliary tank today, Mr. Dale," said MacPherson. "Ye'll remember that the air compressor motor has been taken out and lifted on board the *Albatross* for repairs. That gives us an extra three hundred and fifty pounds of lift and we'll be short five men in the crew, so we'll have about thirteen hundred and fifty pounds of excess buoyancy. We'll have to let about half a ton of water into the auxiliary tank to make her handle well."

"Right you are, Mac, I had forgotten about the compressor motor. Are the air tanks both full?"

"They're not full but we have over a thousand pounds pressure in each one, sir."

"That's more than enough to bring her up. Cast loose from the *Albatross*, Mac, and tell them we'll head due east. They are to follow along and pick us up in about ten minutes."

"Very well, sir."

As MacPherson climbed the hatchway ladder to carry out Dale's orders, Jean Gilmer turned to Jimmy, her face flushed.

STORIES dealing with adventures under the sea are none too common and possibly for that reason they are always welcome.

We remember so vividly the submarine disaster off the New England coast several years ago, when a score or so of brave sailors suffered all the agonies of slow suffocation when their submarine was trapped in the depths.

Captain Meek gives us a story of extraordinary adventure far beneath the sea's surface, and shows us how, when confronted with dire necessity, man's fertile brain tries to find a way out. Incidentally we may say that Captain Meek has purposely allowed a fundamental error in the science of the story. We invite our readers to detect this error and send us their opinions on it.

We will be very glad to print the best letters that we receive.

"Oh, Jimmy, I'm so excited!" she cried. "I never thought you'd *really* take me under when I said I'd like to go!"

"Anything to please you," he replied grinning; "I'm glad you didn't want something harder to supply. We'll be under in a few minutes. I expect you'll get quite a kick out of it. I did, the first time I went down."

"That was during the war, wasn't it?"

"Yes. I was in the submarine service then. That was when I really got interested in marine life. When I left the service I kept after dad until he had the *Loon* built for me. It's different from any other submarine in the world."

"In what way?"

"It's the safest submarine ever built. Being designed for laboratory work only, we don't have to bother with torpedo tubes as the war submarines do, and we could build her with a shape designed to resist crushing. We can safely go down to two hundred fathoms, that is, twelve hundred feet. The pressure there would crush most submarines. The *Albatross* is always with us, so we don't have to carry a lot of fuel oil and stuff like that. That makes her handle easily. One man can handle her without any trouble, as I told you. In addition to the usual safety devices, the hull is divided into six compartments by airtight bulkheads, so that if one were to be punctured we could shut it off from the rest of the boat."

"Would the boat sink if one compartment were to fill?'

"It would, but we have a means of overcoming that extra weight. Held to the bottom by electrically controlled catches, which can be operated from the inside of the boat, is a false keel made of lead which weighs six tons. If we were to ship any water in any way, we could drop that keel and get twelve thousand pounds of extra lift. Another peculiarity about this boat is that we are equipped for taking underwater pictures."

"How can you do that?"

"We have enormous floodlights that light up the water around us for quite a distance and we can photograph through the deadlights which are made of rock crystal. We have a complete photographic laboratory on board, dark room and everything."

An Accident

THE clang of the closing hatch interrupted his words and MacPherson climbed down the ladder.

"All clear above, sir," he reported.

"All right," replied Dale. "Fill the tanks."

As MacPherson turned to the valves controlling the tanks, Dale led the way up the ladder into the conning tower.

"Stand here," he directed, "and watch through this glass. You'll get quite a kick out of watching the water come at you and close over you."

"Tanks filling, sir," came MacPherson's voice.

"All right, Mac, I'll be right with you. Now Jean, I'm going down and set the diving flippers and start the motors. Watch the water, and in about forty seconds we'll be under."

He dropped down the ladder and the whir of electric motors filled the interior of the submarine. Jean gave a squeal of fright as the water rushed at the conning tower and Dale set the flippers at a sharp angle and drove the *Loon* under. Thirty feet below the surface he set the flippers to hold the boat on a level keel and leaving MacPherson on watch he joined Jean in the conning tower.

"Jimmy, are we under the water?" she demanded.

"We're thirty feet under."

"I can't believe it. Look at that deck out there; it's dry. If we were under water it should be dripping wet."

Dale laughed heartily.

"Where would the water drip to?" he asked. "Don't feel foolish, Jean, that's one thing that strikes almost everyone on their first dive. Come closer to the glass and look up."

Jean gave a cry of surprise as she did so.

"Why, Jimmy, I'm looking at the surface of the water, only it's up!"

"What you are looking at is the surface of the air. You are getting just the view that a fish gets when he looks up."

"It's marvelous. I don't see any fish. Aren't there any around here?"

"There are plenty, but you don't see them out of the deadlights of a moving submarine. They probably think it's a big fish and leave the neighborhood. If you want to see fish, you must go down to the bottom and lie there for a long while, and even then you don't always see them. If you go deep enough and turn on the floodlights, you can usually see some. Are you ready to go up?"

"Any time."

"All right, we'll go up. Stay where you are and I'll go down and set the flippers to bring her up."

As Jean watched, the surface came nearer and presently the conning tower emerged and Dale joined her again.

"Mac is blowing out the tanks," he reported. "I'll crack the hatch so that we can get some fresh air."

He seized a heavy mallet and struck the latch a sharp blow. It gave, and the hatch cover sprang open a few inches. He raised it by hand about half-way, and then a heavy spring came into play and swung it wide open. Dale climbed the ladder to the deck, but as his head and shoulders rose above the hatchway he gave a hoarse shout. Simultaneously the submarine shivered under a shock. There was a grating noise and the stern of the boat inclined downward so that Jean was thrown to one side of the conning tower. The boat rocked for a moment and Jean was drenched in a downrush of water. She looked up and saw the sea pouring in through the open hatch. Jimmy struck the floor beside her but he bounded to his feet and fought his way up against the rush of the water and grasped the hatch cover. Anything but the toughest steel would have shivered under the impact of the blow, but the cover held and Jimmy hammered the latch into place and dropped rapidly down the ladder.

"The tanks, Mac, quick!" he gasped, "blow them out!"

He glanced at the depth indicator and his face blanched. They were already sixty feet under the sur-

face and were sinking rapidly.

"I'll handle the air, Mac," he cried. "Start the motors and set the flippers for maximum lift."

The engineer hurried away, but came back in a moment with a white face.

"The motors are both watersoaked, sir," he reported. "They are short-circuited and they won't budge."

Dale glanced at the depth gage again.

"Three hundred and still sinking fast," he muttered. "There's only one thing to do, Mac. Drop the emergency keel!"

The engineer hesitated.

"If we do that, we will be out of control, Mr. Dale," he said.

"I know that, but we've got to spend weight. Man, we are at four hundred and still sinking. Drop the keel!"

"Very well, sir."

MacPherson pulled four switches on the control board and the downward motion ceased with a jerk. For an instant the depth indicator seemed to be standing still but the forward motion of the dial was slowly resumed and the boat sank with extreme slowness.

"Empty the trimming tanks, Mac!" cried Dale.

Trapped in the Depths

THE engineer turned other valves and the increase in the sound of the air hissing through pipes told that the small trimming tanks, forward and aft, were being emptied. Dale glanced again at the indicator and as he did so there was a slight shock and the needle stopped moving.

"We're on the bottom," he exclaimed, "six hundred and forty feet down. It's a good thing that the *Loon* is designed for such pressures."

"What happened to us, sir?" asked the engineer.

"We came up right under the *Albatross'* bow and she rammed us before she could change her course. Didn't you see her in the periscope?"

"Didn't you, sir? I didn't look. I thought you had made sure that all was clear before you told me to turn in the air."

"I thought *you* had looked. I guess neither of us did. Keep the air on, Mac, while I go see where Jean is."

Jean was still in the conning tower, white-faced but calm.

"What happened, Jimmy?" she asked in a small voice.

"The *Albatross* rammed us. We were in diving trim and she rode our stern under and forced us down until the water came in through the conning tower hatch. Are you hurt?"

"No, I'm not hurt, but I'm pretty wet. I was almost drowned by that water."

"Come below," said Jimmy, "and I'll see what I can dig up for you to wrap around you. We'll be up in a few minutes—I hope."

Something in the tone in which he spoke the last words alarmed Jean.

"What do you mean, Jimmy?" she cried, grasping him by the arm. "Are we still under water?"

"We're six hundred and forty feet down and resting on the bottom," he replied grimly. "Our motor is short-circuited by sea water. Mac is blowing out the tanks now and I hope we have buoyancy enough to rise. If we haven't—"

He left the sentence unfinished. Jean Gilmer's face blanched at his words, but she bit her lip and tried to remain calm.

"If we haven't—" she echoed. "Oh Jimmy, do you mean that we may drown?"

"No danger of our drowning," he replied, "the blow wasn't hard enough to start our plates, but it may mean that we stay here longer than we wish. Don't worry about it yet, it will be several minutes before we can get all the tanks empty and we may be all right. We have dropped our emergency keel."

Below he found the white-faced MacPherson engaged in coupling the emergency air tank to the lines.

"What news, Mac?" he asked.

"None so good, sir. We have emptied both the main air tanks and we haven't got all the water out of the diving tanks, sir, not to mention the trimming tanks and the auxiliary tank. I am coupling on the emergency air tank now, sir."

Dale looked at the pressure gage on the side of the air tanks.

"Why, those tanks aren't empty," he exclaimed. "They still show nearly three hundred pounds per square inch."

"At six hundred and forty feet, the water pressure is about two hundred and eighty, Mr. Dale. An equilibrium must be reached, for the needles won't fall any further."

A rapid mental calculation assured Dale of the correctness of MacPherson's figures and he bent his energies to helping connect the emergency tank. When it was connected and the valve opened, he watched the needle. From its initial reading of two thousand pounds, it fell rapidly to twelve hundred and then a hiss of air made MacPherson close the valve rapidly.

"The trimming tanks are dry, sir," he said. "We'll turn her into the auxiliary tank."

The connection was soon made and again the needle fell. It moved rapidly down for a moment and then the motion slowed and at two hundred and eighty pounds, it stopped moving. Dale and MacPherson glanced at the depth indicator and then at one another.

"Is there anything else we can do, Mac?"

"I can't think of anything, Mr. Dale. Our compressor motor is on the *Albatross*, our driving motors which we might rig to the compressor are shorted and we can't use our Diesel engines under water, even if we had a motor to crank them with. It looks like the jig is up."

A slight grating sound came through the hull and the two glanced at one another.

"The tide is taking us along the bottom," said the engineer. "I hope it doesn't take us any deeper."

"If the tide can move us like that, Mac, we can't be many pounds overweight. We might try the hand pump."

"Against twenty atmospheres* of pressure? I'm afraid it wouldn't be much use, Mr. Dale."

"That's true, Mac, but it's the only thing I can think of."

* 280 pounds per square inch.

The two men went to the hand pump but the result was as the engineer had prophesied. The strength of two men was as nothing in trying to pump water against a pressure of two hundred and eighty pounds to the square inch. The pump brake was as immovable as a rock. They desisted after a time and Dale walked forward to the cabin where Jean sat, wrapped up in a blanket she had taken from a couch.

"Is your nerve good?" he asked abruptly.

The girl paled at the words but controlled herself with an effort.

"Is the news bad?" she asked.

"As bad as can be. We have used up all of our air and we are still on the bottom. Our motors are gone and we have no way to compress more air. It looks rather hopeless."

"What will happen to us, Jimmy? Shall we suffocate?"

"Possibly, but I rather doubt it. We have an air-purifying apparatus on board which should keep the air usable for three of us for nearly a month. What I am most afraid of is battery gas."

"What's that?"

A Faint Hope

"WELL, you see, for underwater running when we can't use our Diesel engines, we depend on electric motors which are run from storage batteries. We have shipped a lot of sea water, and if any of it gets mixed up with the battery acid, the combination will form battery gas, or hydrochloric acid gas which is an irrespirable gas and very poisonous. It would kill us all off in a very few minutes. Aside from that, we are safe for a long time. We have plenty of food and water."

"Won't the *Albatross* send down divers and rescue us?"

"No diver could work at such a depth. His ribs would be crushed right in. They may try lowering grappling irons but they probably wouldn't find us even if the tide had left us alone. Do you hear that grating sound? Well, that's the tide moving us along the bottom. We may be half a mile from the place where we sunk. In fact, I would just as soon the *Albatross* didn't get a line on us."

"Why?"

"Because, if they raised one end of the boat, the sea-water would run down into the battery compartment and flood it and then it would be all off. I am hoping that something don't up-end us. Our batteries are a good three feet above water on both ends, but if we tilted— Of course the air-purifying apparatus will take care of some battery gas but if it's used up in absorbing it, we shall smother."

"Why should we smother, Jimmy? Excuse all the foolish questions that I am asking, but I don't know much about that sort of thing."

"Glad to have you ask. It takes my mind off things. You know that we breathe in oxygen and breathe out a gas called carbon dioxide?"

"Yes."

"Carbon dioxide is not in itself very poisonous, but when it becomes concentrated, as would happen with three people using up oxygen and making carbon dioxide all the time, it may become quite a menace. In order to keep the air pure, it is kept circulating through the boat and on each trip it is forced through tanks of soda lime which absorbs the carbon dioxide. The lost oxygen is replaced from tanks which feed a small steady stream of oxygen into the air. But for this system, the air would become dead here in a few hours."

"Isn't there anything we can do?"

"Not much. We have a hand pump, but Mac and I couldn't budge it. You might come and give us a hand, if you like, and we'll all three try it, although I doubt whether there's much use."

They walked aft to the engine room and all three threw their weight on the pump brake, MacPherson and Dale straining until the muscles in their backs cracked, but they could not move it.

"If we can manage to lighten her a few pounds, we shall be all right," said the engineer. "I just got through measuring up the water we shipped, and if my calculations are correct, we lack only about ninety pounds of being in equilibrium."

"It might as well be nine thousand," replied Dale.

"I don't think so, Mr. Dale. I believe we can lighten her ninety pounds."

"How?" chorused Dale and Jean.

"The oxygen tanks."

Dale executed a highland fling and pounded the engineer on the back.

"You've done it, you old pirate!" he chortled. "Jean, didn't I tell you that he was the canniest Scot that ever came out of Edinborough?"

"Not so fast, Mr. Dale," exclaimed the engineer. "Remember, I guarantee nothing. Our oxygen tanks are only charged up to six hundred pounds pressure and they are pretty small. They may not do the trick and if we use the oxygen up for that, we won't have it to breathe."

Dale stopped his dance and looked solemn.

"That's right, Mac," he said. "I hadn't thought of that angle of it. Let me go over your figures."

"You'd better start at the beginning, Mr. Dale. I may have measured the water wrong."

Aided by the engineer, Dale carefully measured the depth of water in the submarine and calculated its weight. To this he added the known weight of the ship, less the emergency keel, the equipment, his own weight, MacPherson's and Jean's, and the weight of water remaining in the diving and auxiliary tanks as shown by the gages. From the total he subtracted the known displacement of the boat. The remaining figure was ninety-six pounds.

"That is within eight pounds of my figures," said MacPherson when Dale announced his result. "Shall we try it?"

"I don't know," replied Dale. "Let's leave it up to Miss Gilmer. Jean, what do you say? Shall we pour our oxygen into the tanks and try to rise or shall we not? If we succeed, it means safety. If we fail, it means a quicker death."

"Whatever you think, Jimmy. Personally, I would as soon die quickly trying to escape, as to linger on, knowing there was no hope."

"We'll try it, Mac!" decided Dale. "Shut off the oxygen and we'll turn the tanks into the air line. If we can raise her six feet we're saved."

"I don't follow that reasoning, Mr. Dale."

"There is still two hundred and eighty pounds of air in the tanks. Every foot we raise her reduces the external pressure nearly half a pound per square inch. Once we get up a little, the tanks will blow out more water and raise us still more and so it will go."

"I hadn't thought of that, but it's true. Well, here goes!"

The Monster of the Depths

MacPHERSON shut off the oxygen tanks which were pouring their life-giving contents into the atmosphere and by dint of an hour of hard labor they were connected to the air lines. Their valves were opened and with pounding hearts the three watched the depth indicator. The pressure on the oxygen tanks fell to two hundred and eighty pounds but the depth indicator did not move.

"We've failed!" exclaimed Dale bitterly. "This is the end!"

"Hark!" replied MacPherson, "The grating has stopped!"

The grating sound that the submarine had made dragging along the bottom ceased. Dale ran up to the conning tower and turned on his floodlights. The submarine was floating a few feet from the bottom. He gave a shout of joy which died even as he uttered it. The boat was over a dip in the ocean bed and had not risen an inch. Instead, it was slowly sinking.

"We are almost in a state of equilibrium," he reported when he returned. "Even ten pounds might make the difference between life and death to us. Think, everybody!"

Another assault on the hand pump proved the futility of hope of escape through that avenue, and a dull apathy of hopelessness settled over the ship. The depth indicator registered six hundred and fifty-five feet when a slight jar told them that they had again touched bottom. Hardly had they touched than a sudden lurch of the craft nearly threw them to the floor.

"Now what?" exclaimed MacPherson.

As he spoke the forward end of the submarine lifted and there was a rush of sea-water toward the after battery compartment.

"Quick, Mac, the bulkheads!" cried Dale as he half slid and half scrambled down the floor of the submarine. MacPherson was by his side and they slammed and latched the door of the watertight bulkhead which separated the after battery compartment and the engine room from the rest of the craft, just as a slight smell of hydrochloric acid gas began to permeate the atmosphere. Jean was taken with a sudden fit of coughing.

"Wet a towel and hold it over your nose!" shouted Dale as he set the example with a handkerchief. "The air purifier will take this much out in a moment."

He scrambled up the slope and closed the door leading to the forward battery compartment just as the submarine began to tilt in the opposite direction.

"What's happening, Jimmy?" asked Jean between coughs.

"A big cephalopod, I fancy," he replied. "We've been attacked by them before. Come up into the conning tower and we'll turn on the lights and see what it is."

He turned on the flood lights and Jean cried out and shrank back against him at the sight which met her gaze. The beast had found the ship and had wrapped four of its fifty-foot tentacles about it and was dragging it along the bottom. Huge eyes glared in through the conning tower deadlights and Jean cried out again in fright. Dale laughed.

"Don't worry about that brute, Jean," he said. "He can't do us a bit of harm and this boat is built so that we can give him a right unpleasant little surprise. Oh, Mac! Rig up the tickler!"

"All right, Mr. Dale," replied the engineer with a chuckle.

"Now watch the fun, Jean," said Dale. "Do you see all those little studs on the outside of the boat? Well, they are electrically insulated from the main hull. Mac is now rigging one terminal of our batteries to the studs and grounding the other terminal on the hull. When he turns on the juice, that fellow will get the surprise of his life."

"I thought the batteries would be ruined by the salt water."

"The after ones may be, but the bank in the forward compartment is all right. They are swung in cradles and will take a forty-five degree tilt without spilling. Terminals come from each compartment to the control board."

"All ready, Mr. Dale!" came MacPherson's voice.

"Tickle him a little."

A sudden tremor shook the boat and the squid released his hold for an instant and backed away. Cautiously he came toward it again.

"Off, Mac!" cried Dale.

The fish made a sudden rush and whipped all eight of the tentacles about the craft. His hard horny beak rang ineffectually on the steel hull and Dale laughed as Jean shuddered again.

"Give him the works, Mac!" he cried.

MacPherson closed a switch and the submarine was jerked through the water by the struggles of the fish. Again the monster released his hold and drew back. The water suddenly grew inky black.

"He has shot his ink at us," explained Dale. "He's good and mad now and he'll grab us in earnest in a minute."

The submarine shivered again as the giant cephalopod attacked, but the electric current was too much and the boat was again released. The inky blackness began to clear. Four more times the beast rushed the submarine, each time more cautiously, and finally gave it up as a bad job. Rather weakly it drew away from the ship.

"Turn off the current, Mac," called Dale. "Our friend has had enough."

"What are all those little bubbles that are rising from the sides of the boat, Jimmy?" asked Jean.

"Hydrogen and chlorine gas," he replied. "Sea-water is an electric conductor, you know, and the current is breaking down the salt into the gases you see."

"Hydrogen gas is what they fill balloons with, isn't it?"

"Yes, it's the lightest gas known. It has more lifting power than helium, the other gas used, but it's rather dangerous because it is highly inflammable."

"If we could just get some of that gas inside the boat, we could rise like a balloon," she said with a smile.

"Good girl!" exclaimed Dale. "Keep up your spirits. There's no use in crying about it and we may win out yet. I'm sorry to have to turn down your suggestion, but there's no hydrogen on board. Let's go down."

An Ingenious Plan

THEY rejoined MacPherson and he laughed as Dale described the struggles of the octopus.

"We have had to tickle several of them, Miss Gilmer," he said. "The whole crew like to have one get hold of us and they all crowd into the conning tower to watch the fun. Our forward batteries are all right, Mr. Dale, but I couldn't get much out of the after compartment."

"All we want them for is light," replied Dale, "and the forward set will do us for as long as we'll want any light. Batteries are rather valueless with wet motors. Mac, is there any chance of drying those motors out?"

"I had thought of rigging a blower on one of them, Mr. Dale, but the air in this boat is saturated with moisture and it wouldn't dry anything. I think that if we had some sulphuric acid, we might be able to dry the air enough to do some good, but there is only about half a pint of concentrated acid on board and dilute would be worthless."

"Sulphuric acid? We might get a little of the hydrogen Jean was wishing we had by mixing it with zinc, if we had some zinc," said Dale quizzically.

"It's not hydrogen that I'm worrying about," replied MacPherson, "it's oxygen. We have precious little of that left."

"We could use both," answered Dale. "Let me think a while and see if I can't figure out a way to supply us with some oxygen. We haven't any chlorate on board."

He sat with his brow wrinkled in thought. Suddenly the two watchers saw an expression, first of inspiration, second of unbelief, and last of joy, race across his face. With a shout he leaped to his feet.

"Eureka!" he shouted. "Eureka and likewise three rousing cheers! Ladies and gentlemen, rise and make your bows to little Jimmy. We are saved!"

"How? What? Why?" they showered questions at him.

"First, Mac, will you please kick me for not thinking of it sooner? Next congratulate yourself and Jean on giving me the idea. Mac, in ten minutes we'll have all the oxygen you can ask for and in a few hours we will be at the surface."

"Mr. Dale, are you serious?"

"I was never more so in my life. Mac, you wanted oxygen, and Jean, you wanted hydrogen. Here they are, thousands of cubic feet of each of them here at our feet."

"Where?"

"The water. H_2O."

"How do you mean to get it in usable form?"

"Mac, you are unusually dense. Every time we have shot the juice to a squid, you have seen bubbles rising from the sides of the ship and yet you fail to connect it up with our need. We have water, we have sulphuric acid, the best of all electrolytes—and we have batteries. What more do we need? We will break down the water by electrolysis and get the two gases we need."

"If you try to electrolyze sea-water, won't you get chlorine gas?"

"Of course, but I'm not going to do it. We have a couple of hundred gallons of drinking water on hand and we'll use some of that. Get a granite bucket of fresh water and dump your half pint of sulphuric acid into it while I dig up a couple of electrodes."

He hurried into the laboratory and came out with two sheets of platinum gauze in his hand.

"This is just what we need," he cried exultingly. "I built better than I knew when I had a small laboratory put in here. Connect your batteries in series, Mac, and bring the leads to the bucket."

MacPherson made the connections and brought the leads to Dale, who attached one of the pieces of platinum gauze to each of them and then immersed the two in the bucket of acid and water. A string of bubbles began to come from each of the terminals.

"Which is which, Jimmy?" asked Jean as she bent over the bucket.

"This is the oxygen and this is the hydrogen," he replied with a glance at the control board. You see, when sulphuric acid, H_2SO_4, is mixed with water, it breaks up into what are known as ions, and from these ions we get hydrogen and oxygen gases.

"I see. And we can breathe that oxygen?"

"Certainly. It is just the same as any other oxygen. We can breathe the hydrogen also; it does us no good but it is just like the nitrogen of the air, it dilutes the oxygen and does us no harm."

"I understand all that, Mr. Dale," interrupted MacPherson, "but what I don't yet see is how this is going to help to raise the boat."

"Mac, you are unusually dense today. Let us consider the matter for a moment. What's the cubic capacity of this boat?"

"Nine thousand eight hundred and sixty-three cubic feet," replied the engineer promptly.

"Correct. Let's call it ten thousand. We have about us ten thousand cubic feet of air, weighing about seven hundred and ninety pounds. Of this weight, about one hundred and seventy-six pounds, or two thousand cubic feet, is oxygen. This oxygen we are continually breathing in and changing in our lungs to carbon dioxide, which is absorbed by our soda lime. This lost oxygen is being replaced from the rapidly diminishing supply in our tanks. We will now shut off the flow from the tanks and depend on the electrolysis of water to supply our needs. Let's see what happens.

"We are replacing this oxygen by a mixture of one part of oxygen to two parts of hydrogen, by volume. Where oxygen weighs about .088 pounds per cubic foot, hydrogen weighs only about .006 pounds per cubic foot. Every time we put into the air from our electrolyzing apparatus one hundred and fifty cubic feet of this mixture, we are replacing one hundred cubic feet of oxygen weighing 8.8 pounds by one hundred cubic feet of hydrogen weighing but 0.6 pounds, a clear gain of eight

and one-fifth pounds. Do you see that?"

"Yes, but what effect is this shortage of oxygen going to have on us?"

"No appreciable effect. It is not lack of oxygen that kills in most cases of suffocation, it is excess of carbon dioxide, a substance which we are constantly removing with our soda lime tanks instead of allowing it to accumulate. We may have to breathe a little faster and even avoid over-exertion but we will live with a good deal less than twenty per cent of oxygen in the air. If we replace just one per cent of it, one hundred cubic feet, we will gain over eight pounds. If we go to what I imagine is about the physiological limit and replace half the oxygen with hydrogen, we will gain eighty-eight pounds, more than enough to start us for the surface, and once started, as I told you before, we are safe."

"How much water will that take?"

"To produce six-tenths of a pound of hydrogen, we will have to electrolyze about 4.95 pounds of water, about two and one-half quarts. This will yield, besides the hydrogen, about four and one-third pounds of oxygen which we will have to get rid of by breathing."

"Will that take long?"

"Quite a while. This is not going to be a fast process, but it will get us there in time."

Success!

MACPHERSON got up and gravely took off his hat to Dale.

"Mr. Dale," he said, "my hat's off to you, sir. I can run an engine or a motor, but when it comes to stuff like this, I'm lost. What am I to do now?"

"Nothing. There's nothing that anyone can do now except wait."

Two hours passed. Jean suddenly sat up on the couch on which she had been reclining.

"Jimmy," she said, "I feel as if my heart was going to burst."

"So do I," he replied. "No wonder," he went on, as he glanced at the barometer, "the pressure is up to 31.5 inches. I'll have to stop the electrolysis. We are pumping gas into the air faster than we can use up oxygen."

He removed the electrode from the water.

"Isn't there some way of getting rid of that oxygen faster than breathing it up, Mr. Dale? I know a fire will take oxygen out of a room, why can't we burn some paper or something?"

"Man, you'd blow us into Kingdom Come," replied Dale. "Hydrogen and oxygen mixed makes one of the most explosive mixtures in the world. There ought to be some way of removing that oxygen safely though. Let me take a look around."

He walked into the laboratory and emerged in a few minutes with a whoop of joy, carrying a large tin can under his arm.

"What is it, Jimmy?" asked Jean.

"Pyrogallic acid," he chortled. "We use it in photographic developing. When this stuff is made into a solution it absorbs oxygen to beat the dickens. I'll make up a solution of it and shake it. The solution will turn brown and the pressure will fall. Watch the barometer!"

He made up a solution of the pyrogallic acid and shook it vigorously. The solution turned brown as he had predicted, and he hastened the reaction by pouring the solution from one bucket to another through the air. As he worked the barometer gradually fell back toward its former reading of thirty inches. He again immersed the electrodes in the sulphuric acid solution and continued pouring the pyrogallic acid from one bucket to another.

"I expect that the acid is about saturated with oxygen," he remarked as he glanced at the barometer. "I'll make up a fresh batch in a moment. Watch the barometer when—"

A whoop of joy from MacPherson interrupted him.

"Damn the barometer!" cried the engineer. "Look at the depth indicator!"

Dale whirled and looked at the instrument. It registered six hundred and forty-five feet and as he watched, the needle moved. It moved as slowly as the minute hand of a clock, but it undeniably moved toward a lower reading. Dale snatched Jean off the couch and whirled her around the boat in a wild dance, MacPherson joining in and enlivening the proceedings with wild war-whoops. Foot by foot the needle's reading rose, and Dale stepped to the light switch and snapped off the lights. For a moment they could see nothing in the sudden darkness, but another war-whoop from MacPherson announced that he could see daylight above. The depth indicator read seventy feet and the upward movement was quite perceptible. Presently the motion stopped.

"What now?" cried the engineer.

"The top of the conning tower must be awash," replied Jimmy. "Let's get on the hand pump."

The two men hurried to the pump and found to their joy that they could move it readily. With long rhythmic strokes they started to drive the water from the interior of the submarine, and the conning tower rose above the waves.

"Get to the periscope, Mac, and tell me if she's clear this time before I crack the hatch!" exclaimed Dale.

"All clear, sir," reported the engineer. "The *Albatross* is about a mile due south."

A quick blow of the mallet opened the hatch and Dale stepped out onto the deck. A quick glance around and he called down the hatchway.

"Say, Mac, pass me up a towel or something white, will you? I want to signal the *Albatross*."

"I'll come up and signal, Mr. Dale," replied the engineer. "You'd better come below. Miss Gilmer has fainted!"

THE END

The Time Ray of Jandra

by Raymond A. Palmer

(Illustration by Leonard)

A group of men came out of a building dragging a struggling screaming woman. They dragged her to the edge of the wall, and as the monster saw them, it moved immediately below them.

I WAS born on the ocean-going sailing vessel, *Sylvester*, during a raging storm, a little over forty years ago, and for lack of a better name was christened Sylvester Gale, as suggested by the name of the ship and the storm in which I first saw light. My mother had been picked up on a raft some hours before I was born, too much exhausted to give her name or explain her presence on the raft. She died at my birth and thus left me a nameless waif, dependent on a rough-and-ready grizzled old sea-captain for my education and rearing. The name proved to be prophetic, for my life has been stormy and adventurous. Now, forty years later, I find myself in a strange position; for although those forty years have passed as surely as I was born, I am now, in reality, only twenty-seven years old, and having quit my seagoing career in favor of a peaceful little chicken farm overlooking the Pacific, I delight in setting down the momentous happenings of my life, reliving strange events as I write. The following record is the history of my life during those thirteen missing years.

In 1944, when the second World War broke out, I was shipped as second mate of the steamship *Merida*, bound for Loanda, Angola, on the southwest coast of Africa, with a cargo of mining equipment for an English mining concern. Our passage was none too smooth, and as we neared the coast, we ran into a bad blow, which drove us some five hundred miles southward off our course before the *Merida* piled up, late in the afternoon, at the mouth of a good-sized river. I now know that it was the Kunene River, which empties into the Atlantic about one hundred miles north of Cape Frio.

I reached the beach in safety, but, horrible to tell, I was the only survivor other than a young pig which the ship's cook had kept for a playmate and companion. Rescuing the pig and letting it romp about on the beach, I sat down to think. I was alone on a strange coast, without companions or means of sustenance. The pig, I reflected, could be my companion for but a day or two, or until I got hungry. After that it would serve as a means of sustenance for a few days, perhaps even for a week, as it weighed nearly thirty pounds.

While I sat debating ways and means of saving myself from my predicament, without arriving at a definite conclusion, I was aroused by the lengthening shadows to the realization that sunset, which comes suddenly in this part of the world, was near. I looked about, and shouted with joy on seeing that the beach was littered with boxes and barrels of every description. Nondescript articles were scattered over the sand all along the point where the river emptied. With my heart materially lightened, I set about pulling the wreckage above high water mark.

My enthusiasm was slightly dampened when I saw that most of the boxes were labeled "Cradle Screening" and various other articles used in hydraulic mining. But among the debris I found one of the hammocks used by the sailors of the *Merida* while aboard ship. By the time darkness had fallen, I had the hammock slung between two trees at the edge of the rocky promontory upon which fate had cast me. Climbing into it, I placed the pig at my feet more with a view to future meals than for companionship, and strange to say, considering my surroundings, was asleep almost immediately.

Fiction writers have either overrated the danger and numbers of ferocious animals, or perhaps the angel of luckless mariners watched over me that night, for not a sign of man-eating lion or even chattering monkey was evidenced for the succeeding twelve hours.

RAYMOND A. PALMER

THE question of man's ability to travel in time—that is, to project himself into the past or into the future—is a subject of great interest at the present time.

It is certainly true that, if we were able to travel in time, we could discover the truth of many mysteries that have puzzled our scientists for centuries. We could go back and see historical events being enacted all over again; or we could go into the future and discover in advance what our probable life was going to be.

This subject of time traveling, therefore, is one of the greatest fascination, and provides a basis for innumerable thrilling adventures. Such is the type of story that Mr. Palmer has written, and we believe that our readers will be just as entranced with it as the editors were.

ON the second day after the *Merida* piled up, I killed the pig, keeping its flesh in an icy spring I had discovered, until, tiring at last of inactivity, I decided to attempt to find a settlement. Trusting to luck to send me in the right direction, I tossed a coin into the air. Heads I designated as up the beach and tails as the signal for the opposite direction. The coin fell into the sandy soil and I was nonplussed to find that it stood on edge between two small stones. At last I decided to go inland, following the river: a course against all reason, for what could I expect to find in the interior? But as its adventurous aspect appealed to me, the question was settled without even a recourse to reason.

Packing the remains of the pig into a piece of canvas and arming myself with a pistol and a miner's pick, which I had discovered in one of the boxes, I set out, cleaning the pistol as I went. Since there were only six shots in the chamber of the weapon and I had not found any more among the wreckage, it behooved me to conserve my ammunition.

Approaching the river, I followed it into the forest. After some very difficult walking through tangled vines and underbrush, I suddenly broke through an especially tangled spot into a sort of clearing. A path, well defined in spite of the fact that it did not seem to have been traveled for some time, led me on, still following the river bank. I took this path to be an indication of a settlement further on, and for two days I followed it, covering, at a rough estimate, about twenty miles a day. On the eve of my second day of marching, I came to the beginning of a paved roadway. I was dumbfounded! A paved road in that section of the country was unbelievable! But what a road it was! Completely blocked in some places by an indescribable confusion of tangled creepers and brush, even trees growing out of crevices in the cement-like material of which the road was composed. It had the appearance of not having been traversed by vehicles of any sort for ages. Even afoot it was hard going.

I followed this road for what must have been some forty

miles, and towards the evening of the fifth day after leaving the beach I came to its end. And now a strange sight met my eyes! Before me rose the partially destroyed buildings of a vast and ancient city. Coming closer to a huge pile that seemed to be practically intact, I stood still in wonder. Was this an ancient city? Where the plaster and bricks had fallen away, thick steel girders came to view, proclaiming the modernness of the construction. And yet the building was old—incredibly old. The stones had been worn almost entirely away by time and the elements, and when I tested its hardness by striking the side of the building with my mining pick, the latter seemed to rebound as if it were made of rubber. Where I had hit the wall, there was revealed but a very small nick. That stone was harder than granite! The tremendous signs of wear convinced me that this was in fact no modern city; on the contrary, it was one of the oldest cities of the earth, perhaps even antedating the last glacial epoch.

Activated at last by a compelling desire to see the inside of this building, which still towered twenty stories into the air, I entered a square opening that gave evidence of having once supported either a door or a window. Grooves in the side gave the impression of a sliding window rather than a door. As I entered, my eye fell upon a peculiar gargoyle, which pointed downward as if the building had at one time been higher. It was now on a level with the ground where it looked ludicrous. One would expect such ornamentation at a higher level.

Inside the building stretched long corridors, well-lighted by numerous windows. At the foot of these windows were strewn the dust and debris of ages, with here and there a glittering piece of glass glinting out of the heap.

Advancing down a corridor, I came to a solid stone door that completely blocked the way. Noticing a knob in the center of this door, I grasped it and pulled downwards. There was a grating sound, and the huge structure rose into the ceiling, and I could see that it was almost five feet thick. I passed through the opening and found myself in a room that surpasses description.

The Mystery of Ninety-Two

I SHOULD call it a hall rather than a room, for its size was enormous. It was fully three hundred and fifty feet long and about one hundred and twenty feet high. There were absolutely no windows or openings of any kind in the room except the door by which I had entered and a similar door at the other end, yet the room was brightly lighted by sunlight, whose source of entry I could not discover.

Along one wall was an array of the most surprising objects my eyes had ever beheld, resting in a succession of niches in the wall, and ranging from one end of the room to the other. At the end nearest me the niches were only a few feet in height and three feet in width. As my eyes traveled to the other end of the room, I noted that the niches became larger and larger. The final niche was similar to the first in width, but it was fully one hundred feet in height. The niches themselves were not so astounding as what they contained. The first few seemed empty but further along I could see the glint of a glass-like substance.

Examining the first niche more closely, I saw that it contained an extremely small glass tube that was visible only by means of a magnifier suspended above it. As I progressed down the hall, looking at the contents of each niche, I noted that each tube was slightly larger than its predecessor. In the large niche at the end was a tube whose huge gleaming bulk towered fully to the top of its hundred foot recess. All these tubes were shaped like a straight lozenge rounded off at the ends. In the large tube a thick cable-like metal wire entered at the bottom rounded end, and, looking up, I could see that a similar cable entered at the top end. The terminals of these wires were metal plates which faced each other. Otherwise the tube was entirely empty. In the small tubes the wires were mere hairs and the plates apparently thinner than gold leaf. In the first tube of all the wires were so thin as to be completely invisible, even under the magnifying glass.

I moved to the center of the room and counted the niches. There were exactly ninety-two. What were these ninety-two tubes supposed to represent? In a space of about six inches between every two niches I saw engraved in luminous characters a symbol which I took to signify the nature and name of the tube next to which it stood. If those characters had only been written in English!

The other wall was just as interesting, if not more so. It was dominated by a large circle about seventy-five feet in diameter, around the outer rim of which were arranged ninety-two little white discs that looked like frosted glass. Ninety-two again! What was the meaning of this number? In the center of the circle a large purple disc, reminding one of the hole in a doughnut, further ornamented the circle.

This large circle was duplicated in miniature by a raised, table-like disc mounted before an operator's chair, except that, instead of white discs around its circumference, there were small push buttons, and in place of the purple central disc there was a little lever. Just above this raised discboard was a dial with figures on it somewhat like a clock. Three hands, all of different lengths, radiated from the center of this dial.

I had been so busily engaged in examining the interesting features of this novel room that I had not noticed that the light was fading and all was becoming dim and gloomy. The sun was evidently setting and I had not over thirty minutes of light left in which to explore. I looked about to see if there was some switch that might betoken artificial illumination, but there was none. The only switches were the ones on the discboard. I determined to experiment with some of the buttons and pushed the first and nearest one. A sudden loud crash behind me caused me to wheel in sudden alarm. The door through which I had entered was closed! I turned and pressed the button again and was rewarded by a muffled clang as the door again rose into the ceiling. Closing it again to assure myself that there was nothing mysterious in its operation, I began to press the rest of the buttons.

The first one I pressed caused the opening of the other door and after I had closed it, I pressed the next button. One of the white discs above in the large circle flashed once and became dark again. Here was a little light at least. The next buttons resulted in the same thing and so on for about fifteen buttons. After I had pressed the sixteenth button, I became aware of a dim blue radiance and turning toward the opposite wall, was astonished to note that each of the first sixteen small tubes glowed with a point of violet or blue light. I turned again to the discboard and pressed the rest of the buttons in quick succession. Each resulted in a flash from its corresponding white disc above and each lit up one of the tubes. The last tube glowed red in all its enormity and filled the hall with light. In the mingled play of ninety-two different shades of light, the room seemed to sway and belly out as if blown by the wind. My hand looked twice as large and seemed to detach itself from my wrist in the rainbow of colors. My clothes seemed to flicker as if afire. Fascinated, I played with the buttons as a pianist plays with his keys, flashing chord after chord of these many-hued lights.

CHAPTER II

Nothing But Thin Air

I GLANCED at the central lever of the discboard. What light did this important-looking lever illuminate? Did it light the purple disc above? If so, where was the tube that should light with the flash? Without pausing to think, I pulled it down suddenly as far as it would go. There was a flash of purple light and as it flashed to each tube, the fire in each seemed to pass through the glass and enter the hall itself. The colors blended and formed a gray blur that blackened into darkness. Almost immediately it merged into bright daylight and faded to darkness again before I could see anything. The alternating white and dark flashes became so swift that they finally blended into a solid gray blur. I felt a strange whirling sensation in my brain and grew dizzy. I felt terribly sick at my stomach. My dizziness increased until I could hardly retain my senses. In terror I groped for the switch and as I did so, my eyes fell on the dial above the discboard. It was a blur of moving hands; the longest hand entirely invisible, the next one a faint blur, and the short one moved rapidly around its path. Strange to say, the dial was the only visible object in the room. I felt myself falling to the floor and grasped the switch in time to pull it back. With a crash the room came back into view, the hands on the dial stopped suddenly, nauseating pains gripped me and I fell senseless to the floor.

When I regained my senses, there was a bustle of life and activity in the hall. It was filled with a dazzling bluish-white light which made me squint. Four strange men were moving about the room, evidently engaged in assembling a machine of some sort, for scattered pieces of apparatus lay in disarray all over the hall. Where had these men come from? And their dress—it was outlandish. I had never seen men dressed in such clothes, except perhaps in the occasional theatres I had visited on my rare shore leaves. Their arms and legs were wound about by a seemingly endless band about an inch wide. They wore a short leather skirt that reached to their knees, a plain band of some dark material around their bodies, while the shoulders and chest were bare except for a strap around the neck from which a peculiar emblem hung down over the chest and back. Knees and elbows were bare also, presumably to allow freedom of movement. Their skin was a healthy white, with red cheeks and the flush of healthy blood in their veins, but their hair was a dull and lifeless white.

I rose unsteadily to my feet and walked over to the nearest one. He seemed not to notice me as I approached, and I accosted him in a loud tone. He paid no attention. I was dumbfounded!

"Hey," I shouted angrily, "Are you deaf?" Still no answer. I strode over to grasp him by the shoulder as he bent over his work. I meant to whirl him around and confront him. Imagine my surprise when I grasped nothing but thin air and fell heavily to the floor from the energy I had so uselessly expended! I was utterly astounded. Had I missed his shoulder when I grabbed? Cautiously I extended my hand and attempted to touch him. Truly, my hair rose on end and I staggered back in horror. My hand passed entirely through his body and he seemed not to notice my presence. Suddenly he straightened and stepped toward me. Before I could move from my tracks to avoid a collision, he had walked straight through me! A sudden terror gripped me and I turned and ran from the room.

I ran the full length of the corridor outside before my terror permitted me to stop my mad dash to get away from the accursed room. I came to a stop before a large window and tried to collect my thoughts as I stared uncomprehendingly on the scene before me. Was I dead? Did my lack of ability to touch any object mean that I was no longer an inhabitant of this earth? Gradually all thoughts of my probable whereabouts dropped from me as I became aware of what lay beyond the window.

FAR below me lay the streets of a mighty city. Teeming thousands of people and vehicles thronged the thoroughfares. A dull roar came up to me from the street. On all sides, as far as the eye could see, magnificent buildings thrust their imposing heads into the sky. The air was filled with myriad cigar-shaped aircraft, similar to Zeppelins except that there were no cabins slung beneath them. The sides were lined with windows and it was evident that they carried no gas-bags to support them in the air. Some strange power activated them, as there were no propellers visible. Through the windows I could see that they were packed with human beings. As I watched, a brilliant blue ship settled to the roof landing stage of a nearby building and disgorged its passengers.

This kaleidoscopic scene was bathed in an indescribably brilliant blue-white light which fairly made the eyes ache. I looked at the sun, and as soon as my eyes fell upon it I covered them with my hands and staggered back. Although it was the size of the sun I had known, it was twice as bright, glaring forth like a white-hot furnace.

Footsteps behind me caused me to turn to see one of the peculiarly attired men walking toward a flight of stairs. I determined to accompany him and see where he was bound. This strange ability to remain invisible to all about me was becoming engrossing. Accordingly I trod immediately behind him as he descended the stairs. He was talking to himself, but I could not understand a word he was saying. He continued down, flight after flight, with me in close pursuit. Finally we came to the ground floor and my guide walked down the corridor to the door which led outside to the street. He stepped through the doorway, and as I went to follow him I ran straight into a wall of solid, painful substance. Nothing blocked my view of the street, but before my searching hands I felt a wall of cold rock. It was the only thing in this strange world that I had been able to touch since I regained consciousness, and by some queer twist of fate, it was the only substance I could not see.

My guide I saw striding down the street outside, but I was powerless to follow. Sadly perplexed, I wended my way again up to the floor where I had first seen the city. I stood looking out of it when suddenly I noted a gargoyle beside the window. Something familiar in its appearance struck me. It was the gargoyle of the window by which I had first entered this mysterious building! Again I was dumbfounded, for here was this gargoyle fifteen stories above the street, and just a short time ago I had seen it on a level with the ground. I leaned out of the window to get a closer view of it, and as I did so my pistol left my pocket and fell outside the sill. It dropped only about six inches and then hung as if suspended in the air! I reached down and an exclamation escaped my lips. To my sense of touch my pistol lay on solid ground! All around as far as I could reach with my hands there was solid earth, grass and pebbles under my fingers. I could feel them, but I could see nothing!

Slowly the explanation of it all dawned on me. Somehow or other those tubes in the hall had placed me in a different dimension. I did not doubt that this dimension was *time*. But at what point in time had I been transferred? Past or future? I understood now why I had been unable to pass through the door below. The level of the ground in relation to the building had changed since the time I was

now in. Yes, I must be in the past! Suddenly reassured, I jumped out of the window and stood on solid ground outside. Rather timidly, though, I began to walk over the invisible but substantial earth, for the sight of the depths below me made me tremble. To my vision, I was two hundred feet above the street. Below me moving throngs went to and fro. Had mortal man ever before been in such a position as I now occupied? Imagine walking over invisible terra firma hundreds of feet above visible earth!

The Tragedy

THEN began one of the strangest sightseeing tours I have ever undertaken. I walked slowly along on the invisible sod, observing the strangeness of the life below me. Many of the people depended entirely on the use of their limbs to go from place to place, but some sped down the center of the street on peculiar three-wheeled chairs. They sat in these with hands on a steering bar before them, and from time to time pressed a button on the front of the chair-car according to their desires in speed and the signals of the traffic signs in the streets. These signs were nothing else but huge revolving bars mounted on a post above the heads of the traffic. They were colored yellow and blue and I noticed blue seemed to be the signal for resumption of traffic, for the chair-cars all stopped when the yellow bar faced them. This applied to the pedestrians also.

Nowhere could I see any automobiles or street cars, nor in fact any other ground vehicles besides the chair-cars. The only other mode of traffic made itself known in a rather startling way. I looked up for a moment from my interested inspection of the streets to see flashing along in the sunlight before me one of the peculiar Zeppelin-like airships. It came speeding straight at me, and, as I tried to duck, struck me squarely in the chest with its sharp prow. As it passed over and through me I could see the interior of the car. Its lower part was occupied by softly humming machinery and the upper part was lined with seats divided by an aisle running its full length down the center. There was no sign of a driver or conductor, the ship seemingly taking its course without the guidance of anyone inside the ship. My sensations as the ship forged along through me were peculiar in the extreme. As each object in it came towards my head, I could hardly resist the temptation to duck, although I began to realize it could never touch me.

After it had passed I resumed my walk, and as I progressed to the edge of the city I noted that I was coming nearer to the ground. Just ahead and on a level with me was the edge of the city. It ended abruptly in a high wall many feet thick that separated the city from a luxuriant and steaming jungle beyond. There were no trees such as we know, nor bushes; all was composed of huge hundred-foot ferns and long waving fronds. The ground was covered with rotting vegetation and muddy-looking water lay in brackish puddles all about. I stood in wonder, contemplating this strange jungle, and as I watched, the fronds in the distance began to wave.

Through the waving ferns I could indistinctly see the approach of some huge animal. It looked like an enormous alligator standing on its hind legs. As it suddenly burst out into the clear space below me, I gasped in amazement. It was a mighty, gleaming, plated monster that stood on two enormous hind legs with ridiculously short and small forelegs held high above the waving fronds. Its small, wicked head turned to and fro as it inspected the wall of the city. A long, heavy tail dragged behind it and I was given a demonstration of its power when it became caught between two huge ferns. With a careless flip of its tail the monster swept both ferns to the ground, shattered to pieces.

It seemed to be waiting for something to appear on the top of the wall to my right, for it stared steadily toward this spot, giving vent the while to earth-shaking growls and roars. Suddenly, a group of men came out of a building that abutted on the wall, dragging a struggling, screaming woman in their midst. They dragged her to the edge of the wall and, as the monster saw them, it moved over to a point immediately below them. Cold sweat broke out on my forehead. What were they going to do? Were they going to feed the poor woman to that awful prehistoric monster? My question was answered immediately, as the woman was cast off the wall. She was caught in mid fall by the hungry beast. . . . .

What kind of people were these that could so cruelly and heartlessly cast this woman to such a horrible fate? What had she done to deserve it? In that moment the glamour of my position vanished. I determined to turn my efforts henceforth to getting back into my own time at any cost.

AS it was now growing dark, I hastened back to the building I had left early that morning. As I entered its dark shadow, I was stopped by the peculiar actions of a man in a long cloak immediately below me. The street was deserted by this time and I watched him to see what he was up to.

He waited, crouching in a dark doorway, while a lone striding figure approached down the street. As the figure drew opposite his hiding place, he sprang out, drew a long sword from beneath his cloak and with a vicious stroke, ran his victim through. I had shouted in warning, a shout that died in my throat as I realized my powerlessness to prevent the deed below me. I looked again at the scene. The murderer was rifling the pockets of his victim. Suddenly, from the areaway of the building beside the murderer a group of men sprang out, and before the killer could move from his tracks they had surrounded him and made him fast with a peculiar sort of metal collar attached to a chain which was carried in the hand of the leader. This group of men were obviously the police of this strange city, for they wore a uniform of a sort: bright red leggings, yellow cape, and a leather holster containing weapons—a sword, a short knife and a peculiar little hollow tube with a small glass bulb on one end, strapped about their waist. In addition they wore the leather skirt I had observed on all the males of the city. It was with a slightly better regard for the city, that I turned toward the only place I might call home—the building from which I had first emerged.

I stood at the window of the building musing over my position in time and wondering how I should get back into my own dimension, when a faint, distant roar jerked me out of my preoccupation. A lion! Again it roared, and this time something peculiar in the tone made the hair on the back of my neck stand up in an overwhelming horror. I realized suddenly that it was not distance that caused the far-away feeling, but actual faintness! The lion could not be more than fifty feet away, but I was powerless to see it, for the simple reason that the lion was not in the dimension of the city, but in my own dimension! I could touch the ground in that dimension, so why couldn't the lion touch me? However, the horror of my predicament sent me scuttling in terror through the window and back into the room of the four scientists—for such I assumed them to be. I had no desire to have an invisible lion tear me to pieces nor, for that matter, any lion at all. Once inside the walls of that room, I had a feeling of at least temporary security.

CHAPTER III

A Strange Predicament

I HAVE always been able to sleep in any place and under any circumstances, so it was not long after I lay down on the hard floor that I fell into a sleep full of dreams of giant monsters gulping down whole crowds of people, and of sneaking, cloaked creatures thrusting their sharp swords into defenseless men and women. These dreams were counterbalanced in a measure by lines of grinning murderers being led away with enormous chains about their necks.

When I awoke it was broad daylight, but there was no one in the room as yet. As I sat up and rubbed the sleep from my eyes I stretched my arms and touched the wall as I did so. A sudden thought struck me. How was it I could touch the walls and floors of this building, and nothing else? The explanation, which was simple, took me some time to figure out, but I finally came to the conclusion that the walls, being present in both kinds of time, were therefore materially present in both dimensions.

Having nothing else to do, I decided to explore the building and later take another stroll about the city. Accordingly, I went first to the top floor and inspected each room that was not closed. They were empty for the most part, but some of them were storerooms for a multitude of strange objects: giant tubes, intricate pieces of machinery, row upon row of storage batteries, glass vessels filled with some peculiar liquid, and a variety of pieces of furniture. All the floors above the scientists' room were similar to the top floor, and I passed on to the lower floors. These seemed to be living apartments, for most of them were closed and the ones that were open contained a bed and a few chairs. When I came to the second floor, I stumbled on a room that was to prove of great interest to me during the next few weeks. It was occupied by a number of little seats and benches, just as is a modern schoolroom. There were books lying on every bench, and, forgetting myself for the moment, I attempted to open one and glance at the contents. My failure chagrined me thoroughly, for I was eager to learn something of the language of the city, so that I could learn what was going on from the talk of those around me.

During the day, I had seen a few groups of people listening intently to the harangues of a few debating individuals. They had evidently had an interesting subject, for the crowds had alternately cheered and booed the two speakers. I determined to wait until school should begin, but was frustrated by something I had hitherto overlooked. I realized that I was hungry! Where could I lay my hands on any food in this place? When I realized that I could get no food, my hunger redoubled and my fears increased. Something would have to be done. True, I had had about twenty pounds of pork left in my canvas sack, but that had been left at the edge of the jungle when I first came upon the city, so it was still in the other dimension. But wait! Could I not touch it as easily as I could the earth of my former dimension? I seized upon the faint hope and rushed from the building. I remembered that I had come on a straight line toward the window, so I retraced my steps in the same direction.

I covered the distance, as nearly as I could judge, from the window to the forest, and dropping on my knees, I searched the ground thoroughly all around. I hunted for over an hour and finally, just as I was about to give up in despair, I came upon the canvas. I believe it was then that I received my greatest shock. True, I had found the canvas, but canvas will not keep a man alive. It was torn open and its contents gone! No doubt, the lion of the night before had found it and eaten it. I stumbled to my feet wearily. As I did so, I scraped against a bush. Eagerly I felt of its invisible branches. It was covered with berries! I began picking them, but as I stuffed a handful into my mouth the thought of poison came into my mind. I could not see these berries to recognize their nature, nor could I even see whether they were ripe or not. But my hunger finally overruled judgment, and I filled my stomach with them. Some were not yet ripe and were very sour, but by picking only the largest ones I managed to get the ripest. I laughed when I thought of the peculiar sight the bush would have presented to anyone in the other dimension. I know I would have stared astonished, if I had seen a bush mysteriously shaken with no visible agency to cause the movement. I retraced my steps to the city with an uncomfortable feeling in my stomach, but, in my eagerness to return to the schoolroom, I ignored it and hurried back. When I arrived, school was already in session. The pupils, dressed exactly like their elders, were sitting at their desks with their open books before them, listening to the explanations of the teacher.

I HAVE read a few novels from magazines I had gotten hold of during my sailing career, and I remember the scoffing I had directed at the "love at first sight" maxim most of the writers employed. But I will admit that I changed my views with my first sight of that teacher. The only word I can think of to describe her is stunning. I could call her heavenly, divine, and all that sort of rubbish, but I was not raised that way, and even these words would fail to describe her beauty. She was small, not much over five feet in height, with dark, wavy, rippling hair and brown eyes. Her complexion was light and, although she evidently used some sort of artificial coloring on her face, making her cheeks too bright a pink to be natural, the effect was pleasing on the whole and effectively threw her pearly white teeth into prominence. As her hair was dark, I would naturally have supposed her skin to be dark also, but, as I was to learn, it was one of the peculiarities of the people of the city to have light skin, no matter what the color of the hair. Keeping my eyes on her face, and listening to her melodious voice, I utilized my new found ability and slid into the seat of a small boy in the first row. His little arms, apparently protruding from my own body, held an open book before him. It was filled with pictures with curious symbols beneath them and the teacher was evidently reading them to the pupils. Suddenly she addressed the pupil on my right, who arose and began reading from the first page of the book. My boy, if I may call him that, also turned to the first page. I listened as he read, and noted the heading of the paragraph or, as I should say, the column he was reading, as the words were written in columns down the length of the page. The word at the top he pronounced "hask," and I glanced at the picture to see what "hask" might be. Staring at me from the page was one of the little boys around me or a replica. So, *hask* was evidently a boy. I chuckled. This was not going to be so hard, especially with the good looks of the teacher, although I sometimes found myself looking at her instead of paying attention to the reading that was going on.

After school was out I followed the teacher to see whither she was bound. She stopped at a slot near the door and inserting a round object, withdrew a printed card. Reading it as she walked, she left the building in the direction I had gone the day before. I followed her to the wall where I had witnessed the seemingly cruel feeding of the monster. A crowd was congregated on the wall and the tyrannosaurus was roaring and barking outside as he did on the other occasion. I was disgusted. Were these people congregated to

see another such brutal spectacle? Was my teacher here for the same purpose? I waited to see.

From the door where the woman had been dragged another procession came. There was no dragging now, as the victim was a man, and I have since learned that there is no yellow streak in any of the males. He marched bravely, or should I say arrogantly, to his fate, and to cap it all, himself leaped into the monster's jaws with a nonchalant gesture at the crowd. I recognized him in that moment as the murderer of the night before. So this was their method of punishment for crime! I suppose their method was just enough, but I can never reconcile myself to the terribleness of it. They could at least have executed them by hanging or the sword. As he leapt, I watched the teacher and derived a certain amount of satisfaction from the fact that she covered her eyes and turned away. So she was not so cold-blooded as some of the other females who laughed uproariously at the disgusting sight of the criminal's legs protruding from the monster's mouth.

The Hole in the Earth

SHE melted into the now dispersing throng, and I stood for a moment debating what to do for the rest of the afternoon. As I was hungry, I advanced across the wall and gathered my dinner of berries; and this time I was lucky enough to stumble on a banana tree. The fruit, although small and not of a good quality, filled me with satisfaction and I marked the place in my memory for future visits, although it promised to be a hard job to find an invisible banana tree every time I was hungry. After I had finished, I stuffed a few bananas into my pockets and took my way toward the center of the city. I had not explored that portion before, having confined my efforts to getting to the edge of the city on the other side. Now I laid my course straight toward a huge building near the center that overtopped all its neighbors, as the upflung torch of the Statue of Liberty surmounts the shipping of New York.

I continued straight along my way, ignoring the streets and passing over the mounds that marked in my own dimension the apparently standing buildings of this city of long ago, and soon arrived at the portals of the building. It was evidently the center of legislation and authority in the city, for inside there were many solemn gatherings, all debating on some unknown subject—unknown to me because of my ignorance of their language. I determined to try harder than ever to master it by attending the class of the beautiful teacher every day. Having no means of knowing what the discussion was about, I soon tired of the place and passed [illegible]

As I neared the exact center of the city I came upon one of the most stupendous things I have ever witnessed. Below me was a hole in the earth a full mile in diameter and extending down into the center of the earth until its bottom was lost in the distance. Standing around the hole, and kept away from its edge by a protecting wall about ten feet high, were a crowd of people. At intervals along the wall were shouting men, who evidently had something to show, for they often indicated a peculiar object at their sides. Men and women were offering them coins and peering into this object, so I too hurried over and endeavored to get a glimpse of the scene in the glass ball, for such it proved to be. For a moment no one was bending over it and I got a clear view of the scene. I gasped in amazement, for in the ball I could see the bottom of the great hole. Men were swarming about in it, or rather on top of a huge metal disc at the bottom, that was the exact size of the hole. From the edges of this disc swirling vapor was rising and being drawn off through vent holes in the side of the great hole.

As I watched I could see the great disc sink slowly downwards. A feeling of awe came over me as I realized that the vapor arising around the sides was the only remaining vestige of the solid rock that was being disintegrated beneath. What was the purpose of this vast hole in the earth? It must have been very hot at the bottom for all the workers were dressed in something that looked like asbestos, and leading down the side of the pit were pipes that betrayed their refrigerating nature by the heavy coating of frost they carried. The workers at the bottom were merely extending these pipes and fashioning new vent-holes as a lower level was reached, keeping pace with the disintegrating disc.

The hole was brilliantly lighted all the way down and, advancing on my own solid but invisible earth, I moved over to the center of the pit. Looking straight down I noted that the pit was not entirely straight, as slight variations occurred where one side of the disc had apparently reached a softer, or more easily disintegrated, spot in the rock. These faults were not large, though, and in the main the pit was straight. I looked down at the center and found that the walls came together there, far below—proving that the pit was more than thirty miles deep, since the focal point of a mile-wide pit is approximately that distance.

I must have gazed too long at the pit, for I suddenly became frightfully dizzy and could scarcely crawl to the edge of the hole. My dizziness lasted all the rest of the afternoon and I made my way back to my base, as I was now beginning to term it, and tried to go to sleep without my supper, feeling too miserable to eat the bananas in my pocket. For the next few weeks, I determined, I would devote myself to learning the language of this strange, yet wonderful and terrifying, city.

CHAPTER IV

The Time Ray

FOR three weeks I attended the classes of the beautiful teacher, leaving the room only long enough to eat my meals of berries and bananas. Several nights I had spent the greater part of the remaining hours of light in studying out of books accidently left open on the desks. My progress had been swift, for the language of the city of Jandra (for this I learned was its name) was exceedingly simple, having but about ten thousand words altogether, of which I believe I learned about seven thousand. I found that any glass vessel was called by one name unlike our different names for dishes and other glass utensils. There was only one word for any article of wearing apparel, and thus the extreme paucity of their language, which at first was very confusing to me, was explained. They simply called similar objects by the same name and let it go at that.

During these three weeks I had come to love this teacher madly; and my inability to talk to her, the knowledge that I could never hear her dear lips speaking to me—since she would never be aware of my presence—plunged me into the depths of despair. She was ever in my thoughts, even when I was watching the interesting experiments of the four scientists of the room of tubes. Through my newly acquired knowledge of their language I learned the story of the tubes; and their presence and the purpose for which they were built was explained. These men were a few of a group that was attempting the passage, either backward or forward, of the dimension known as time. Several attempts had been made and finally a partial success was attained when one of them succeeded in traveling into the past, by means of the tubes and apparatus that had brought me back in time; but it was a complete failure for their purpose, because when one was sent into the past via the

tubes, there was no means of returning. One of their number had been sacrificed in this attempt and thus there were now only five left. Four of them were engaged on a machine in this room, while the fifth was at work in some city they designated as Porthus, which, from the motions they made when they mentioned it, was evidently somewhere above our heads; as I now believe, they meant one of the other planets, probably Mars.

It was about the second week of my tuition that I witnessed one of these experiments, the invention of the man who had been in Porthus. He arrived, one day, with a load of equipment and proceeded to set it up on the floor of the hall. It was a simple-appearing little machine, consisting of a glass cabinet with an electrode on each side. Wires from each led to a series of storage batteries that were of the same type as those stored above in the upper floors. Before demonstrating its action, he engaged in a long discussion with the four men, explaining how the cabinet caused one to move through time. His explanation reached the extent of a lecture, and I shall reproduce it here as faithfully as I can remember it, also allowing for my incomplete knowledge of their language and the varied meaning of their words.

"When Oranus Drey (the scientist who first succeeded in going into the past) undertook his unfortunate journey, he forgot to think of his return. I have made certain of a means of return by a system of levers by which I can reverse the action of the instrument so as to return at any moment by a simple motion of my finger. The cathode ray, as you know, will ionize a thin and attenuated gas in a closed tube. An ordinary atom is electrically neutral, that is, it has no apparent charge of electricity, for the negative charges of its revolving electrons are offset by a positive charge in its nucleus.* But when the molecules of a substance are broken up by chemical action, by the effect of high temperature, or by an electric discharge, the pieces are electrically charged, becoming ions. By ion we mean an atom from which a negatively charged electron has become detached, thus leaving the rest of the atom positively charged and therefore ready to combine with any other ray which the electrode may discharge. Thus when the 'Time Ray,' as I call it, is discharged, the particles become changed in their relation to time and are sent into a different dimension. My invention is an improvement over the cathode ray I speak of, and I am able to ionize solids as well as gases. Now, watch closely as I step into the cabinet and go into the future."

AND with his words, he stepped into the cabinet, closed it tightly, and with a wave to his companions, turned on the current. What happened afterward is not quite clear to me, as I do not understand the meaning of the things I saw, but I will describe them so that anyone reading this may understand, perhaps better than I did.

The walls of the cabinet became a play of iridescent colors similar to a soap bubble, while, in the upper portion of the cabinet and in each wall where the electrodes were, a corona formed, crackling viciously. Small sparks flickered in the air inside the cabinet. The walls took on a brilliant radiance and the figure of the man inside began to glow with the colored rays. Suddenly, with a sharp click, the radiance faded, the cabinet disappeared, and of the apparatus, batteries and all, nothing remained with the exception of something the four scientists were staring at with horror-bulging eyes. I could see no significance in the presence of several gallons of water spilled on the floor, but the words of one of the scientists made the horrible fact clear: "He forgot to take all the elements along with him. The elements of hydrogen and oxygen were left behind. It is a lesson to us—to be sure that all the elements are affected by the ray."

I shuddered when I thought of the unfortunate man who was eternally traveling on into the future. Soon after the horrible experiment that ended so tragically, the four scientists left the room and I returned to my classes.

When I considered myself sufficiently educated in the language of Jandra, I undertook another trip to the center of the city and the great pit. I saw nothing new except that the pit was several miles deeper than formerly, and, as it seemed to me, an ominous-appearing vapor was issuing from the top of the hole. When I obtained a glimpse of the bottom through the glass viewing balls, I found that the workmen were no longer fashioning vents to take off the vapor, but were confining their efforts to extending the cooling pipes, allowing the vapor to ascend as it might.

They were evidently working under difficulties, as there was something like a foot of a soft powdery substance upon the floor. The vapor rising from the pit obscured the view somewhat and I turned my attention to the conversation of the groups of people standing round, in an effort to learn the meaning of all this astounding and apparently meaningless labor. Did not these people realize that the earth is molten at its core and did they not know that they must break through the crust of the earth very shortly? The earth's crust, according to the general belief, is about sixty miles thick on an average, with an enormously compressed sea of molten lava beneath it. What would happen, should this terrible sea of white hot matter be loosed in the hole? I trembled to think: it would undoubtedly rival the eruptions of a volcano.

Wending my way through, or rather above, the crowds, I gathered the gist of a tremendous story, of a vast undertaking, consisting in a deliberate effort to penetrate to the earth's supposedly hollow interior! I will repeat, arranged in sequence as nearly as I can, the story of the great pit's beginning and its purpose, as I was able to piece it together from the scattered conversations I overheard.

It seems that about two years previous a group of men, called (as nearly as I can translate) "Interiorists," convinced themselves and a group of rich men that the earth was hollow and that great benefits were to be derived from the opening of a passageway through to the imaginary inner world. A year had been spent in recruiting vast sums of money from the extensive holdings of these rich men in their native land, Atlantis. As a result, the great physicists of the realm were called together to design and construct a machine capable of doing the vast amount of digging that would be necessary to penetrate the estimated fifty miles of earth between the two worlds.

Much money had been wasted on great and expensive machines whose operation was really good on the surface, but which, as soon as rock bottom was struck, bored their way for a few feet into the underlying soft limestone and then refused to budge another inch. Several such machines were constructed before a really great discovery was made, in the form of a rotating, plunging drill that first bored a small hole, and then, rising, again descended, this time plunging its way through as much as sixty feet of rock at a single blow. This drill penetrated to a depth of eight miles and then stopped, stuck fast in a layer of granite; nor could it again be raised to the surface.

Hopes were low at this point, when the obscure chemist, Korthandahl, announced his discovery of a disintegrating vibration, whose mode of action I could not learn, but I gathered that it was electrical in its nature. The great disc

* The atom is supposed to be composed of a nucleus surrounded by electrons revolving about it at a high speed.

at the bottom of the pit was constructed to utilize the discovery, and now after six months of action, it had penetrated to a depth of thirty-nine miles.

Rebellion!

THE lower classes of Jandra had watched the experiments with dubious interest and a group was even formed that swore to destroy any successful machinery. They had laughed at the first experiments, but as the success of the disintegrating plate became more and more apparent they became sullen and menacing. Convinced that the earth had a molten interior, they had made several attempts to destroy the plate, but had been repelled by the armed forces of the ruling class. On one occasion they had nearly succeeded. Managing to get to the wall surrounding the pit by massing their forces and waiting for an auspicious moment, when the guard was being relieved, they had dumped into the pit several hundred pounds of explosive stolen from a government arsenal. But, being ignorant of the use of the stuff, they had neglected to include percussion caps; so the explosive had failed to explode.

After this attack, which had proved so nearly successful, vigilance was increased and the arsenals were more carefully guarded, making it practically impossible to repeat the undertaking. For several months nothing had been heard of the "Preventists," as the leading rebels called themselves, but lately, when the vapors had gotten out of control, and the ominous cloud that continually hung over the pit reminded the people of the warnings of this group, they flocked to the order in droves and insisted on being admitted to membership. The populace was becoming terror-stricken and was demanding that operations cease at once. The only response to the demand had been the increase of the guard around the pit and the addition of another crew of workmen to remove the dust which now settled so deeply on the floor of the hole.

This, then, was the situation when I came on the scene. What happened later I will relate from my own observation. After I had learned this much, I advanced over the hole for another view of its interior, but was frustrated by the dense clouds of smoke which were now issuing from the opening. Suddenly through the murk there appeared the form of an airship such as carried the traffic of Jandra. Its blue prow hove up before me and landed on the edge of the pit. Thirty blackened and dogged men stepped from it and refused to work any longer at the bottom of the shaft. The heat, they said, was becoming unbearable, and they were convinced that the earth was molten at its core and not hollow as they had been led to believe. As they told their stories, I noticed that cordons of guards were being slowly drawn around the thirty workers. Having aired their views and demanded their discharges, the men found themselves confronted by armed soldiers who surrounded them on all sides and led them away. Then all hell broke loose. The unorganized populace, who had been watching the proceedings, suddenly surged forward in a body and in a moment all order was lost in a mêlée of struggling men and women. For perhaps fifteen minutes the battle raged, then, upon the advent of reinforcements for the guards, the people withdrew, grimly protecting the thirty men in their midst.

I STAYED around all day watching the proceedings. Finally, finding that there was to be no more excitement that day, I left for my base, stopping on the way to eat my dinner of bananas and berries. As I entered my building, I could see the column of smoke waving like a long plume in the breeze and overshadowing the other portions of the city.

When I arrived in the hall of tubes, I found another experiment in progress. This time the machine was constructed on an entirely different principle from the cabinet-like machine, whose operation had resulted so disastrously. It was in the shape of a huge glass ball, seven feet in diameter, mounted on a succession of graduated metal discs connected to a strange dynamo. These discs were approximately an inch thick, and, as there were ninety-two of them, the entire machine, ball and pedestal, was very nearly fifteen feet high. In the top of the glass ball there was a large electrode, and in its base there was imbedded a large metal plate which formed the anode. This anode was insulated from the base of the machine by a layer of some substance that I took to be a combination of a kind of bakelite and rubber mat. The electrode at the top was also insulated where it issued from the glass globe, and from its outer end a series of wires extended to the dynamo and to each of the metal discs below, which were insulated from one another by sheets of the same strange material. On one side, near the base, was a round plate of glass, threaded with a fine screw thread and evidently intended as a means of ingress and egress, for a round hole in the ball, also threaded, provided an opening just large enough to permit entrance.

As I inspected the great glass ball, the four scientists were talking together. They also went through the motions of farewell, which in Jandra consisted of patting the top of one's head and bowing slightly at the waist. They were evidently making sure that, if something did happen, they should have at least said good-by!

When they had finished their discussion and good-bys, one of them advanced and crawled into the globe. The three others outside screwed the cover in tightly and covered it with some substance not unlike sealing-wax, while the one inside did the same on the inside. When this was done, all was ready for the turning on of the current, which was done by the man inside the glass ball. The manner of starting was practically duplicated from the start of the first experiment I had witnessed, with the exception of a slight whine from the dynamo. The single corona began to crackle overhead and the small sparks again flickered in the air inside the ball, and the walls took on the same brilliance that had marked the first experiment. But the remainder of the experiment seemed to be entirely different.

In the first place, the globe did not disappear, but the man inside did. He seemed to glow for moment, shivered, then dissolved in a cascade of sparks. The glass ball was untenanted, but the dynamo whirred on and the three scientists stood silently watching. For perhaps ten minutes nothing happened; then a slight luminescence inside the globe caused them to lean forward expectantly. Suddenly, with the same shower of sparks that had marked his going, the figure of the man reappeared inside the globe. He switched off the current and then slumped to the floor. Quickly the other scientists unscrewed the cover of the entrance and dragging the one inside out into the open air, began the working of the arms and pressure on the lungs that betokened resuscitation. There was a slight fluttering of the eyelids as the unconscious scientist began to breathe regularly again, and when he finally opened his eyes the process was stopped. He was very weak and regained his feet with difficulty; but on his face was a smile of triumph that told, better than any words could, how well he had succeeded.

He staggered over to a small dial and, reading the figures thereon, shouted with joy. He had traveled seventeen thousand years into the future! This in itself astonished me; but his words, when he described the age he had visited,

or as much of it as he could see from inside the globe, really made me lean forward in amazement. For he described the room exactly as I had first seen it, and two objects that he saw, I recognized, namely, the mining pick I had salvaged from the wreckage of the *Merida* and a sailor's cap that lay beside it. He had taken pictures of the scene, and I eagerly looked as he showed them to the three scientists. Yes, it was my hat and my pick, and to prove it more forcibly, there were my footprints all over the hall in the dust that had covered the floor! To say that I was excited is putting it mildly, as I fairly jumped up and down when I realized that here was a means of returning to my own dimension. I ran to the machine, but stopped suddenly as I plunged half way through it! *I had forgotten that I could touch nothing in this dimension except the things that were present in both.* I was stunned. Was I doomed to remain in this terrible existence all my life? In despair, I slumped to the floor and buried my head in my arms, sobbing like a baby after the reaction.

CHAPTER V

Into the Pit!

As soon as the scientists had retired, I tried to sleep, but I was not destined to succeed that night. I had barely closed my eyes when a faint, strangely menacing noise beat upon my ears from the distance. It was the shouting of a multitude, and, from the sound, it was coming closer. I sprang to my feet and went to the window. I could see the waving torches as the mob drew nearer, and I decided to investigate. I did not wish to miss anything of the weird drama that was being played in Jandra, seemingly for my own benefit. I suspected another attack on the pit, and ran in that direction, but I soon retraced my steps when I noticed that the crowd had stopped. They were congregated around a huge building that I judged to be the place where the cigar-shaped aircraft were kept during the night. By the time I arrived the fighting was already nearly over; the guard of the building, being few, had succumbed quickly.

The mob had swarmed into the building and now, through one of the large openings in the wall, one of the huge airships was being shoved. As it came in sight, the remaining people in the street cheered, and, dashing into an opposite building, soon reappeared in the tower. This tower, I had found, was the place from which the ships were controlled. During the daytime there were only three men in the directing room, but as travel was very lax at night, there was only one man there, serving more in the capacity of watchman than operator. He put up a stiff resistance, but was finally overcome as the door crashed in and the mob swarmed over it. One of their number sprang to the operator's seat, and throwing a switch, began to maneuver the stolen ship towards the northern section of the city, where he caused it to settle to the ground. The mob had followed and was now engaged in loading something into the ship until it fairly sagged. Whatever they were loading in was heavy, for each man staggered under a ridiculously small piece.

When they had finished, the operator pressed a button, and the great ship rose ponderously into the air and headed in the direction of the pit. I suddenly realized what they were going to do and gasped as I thought of what would happen when that ship was dropped into the shaft. A drop of over forty miles would cause the ship to attain a tremendous acceleration and I feared for the solidity of the remaining bit of crust. If this held, the disc would be destroyed, and perhaps a calamity would be averted—but suppose it did not hold! As I wanted to be present when the ship was dropped into the hole, I raced over the uneven ground, barking my shins and getting many a mean bruise as I ran headlong into solid objects. I reached the edge just as the ship was maneuvering into position over the pit. The guard of the pit were helpless, for they had not thought of this contingency; they could only watch in terror as the ship slowly neared the center of the hole. Several of their number raced off, probably in search of the scientists who were supervising the construction of the hole. They soon returned, bearing a strange apparatus. This they set up and then aimed it at the ship, which was hovering like a menacing thunderbolt above the pit. I judged that it was a disintegrating machine somewhat similar to the disc that was engaged in digging the shaft to the inner world. But it was destined to failure, for as the crowd saw what was going on, they surged forward in an irresistible mass and, just as the current was turned on, overturned the machine. It swung around as it fell, sweeping the earth, and of the fiercely struggling mass of people and soldiery there remained, in a few moments, only a thick cloud of dust that settled slowly to the ground.

At this moment the hovering ship, at the motion of the operator in the directing tower, plunged into the abyss with a sighing rush of air. I advanced over the hole and watched its descent. Straight as a plummet it fell, gaining speed and dwindling to a speck, until it was hidden by the rising column of dust that swirled in its wake.

The very earth seemed to hold its breath, as it waited for the catastrophic explosion I was sure would follow. It seemed an interminable age of waiting before the first echo of the crash came. It grew in volume until, from a sighing roar, it became a crashing thundering. The ground began to shake and the roaring grew to intense proportions.

THE first indication the people of Jandra had that all was not well, was the thunder of the great law building as it leaned gently over and toppled its tower into the pit. All the great buildings in sight were swaying like huge pendulums and, as they fell, they carried their smaller neighbors with them. I stood transfixed, still over the hole, until I was aroused by a stupendous roar immediately below me. Surging up the tunnel, in a cloud of belching flame, came a seething sea of boiling lava! I was suddenly engulfed and could see nothing but a ruby red swirling mass around me. My terror had been absolute as the fiery mass rushed at me, but now, realizing my immunity, I walked blindly, stumblingly, through the red mass for a seemingly interminable period. Finally I came to a spot above the lava, which was spreading swiftly on all sides except to the north, where it was held by the still standing portion of the law building. A tremendous column of lava was shooting from the pit to a height of nearly a mile. It shot out obliquely, falling far to the south and completely engulfing the southern portion of the city. The night sky was a brilliant ruby red in which the moon was a vague pink spot. Parts of the city that were not entirely engulfed were blazing fiercely, adding to the red glare.

I suddenly thought of the machine and the scientists. What were they doing during all this destruction? I increased my speed as I realized that they would try to escape by going into the future. My breathing quickened. If they went as far as formerly, would I not be able to touch the machine if it were in my own dimension as well as in this? I fairly raced as I thought of this, and I arrived at the building far in advance of the flames. As I burst into the room I found the dynamo whirring, but there was no sign of the scientists. They had already left—were even now on their way into the future. I leapt to the ball and tried to touch it; but evidently they had not yet reached

my own time. I waited, occasionally touching the ball to see if it was in my own dimension. As I waited, I walked to the window and took a look at the now almost completely destroyed city. Only the northern portion had escaped the lava, and even this lay in ruins from the earthquake with the exception of a few buildings. The fountain of lava was not nearly so high now and it suddenly ceased altogether as another severe tremor shook the earth. A nearby building, already leaning precariously on its foundation, fell to earth with a shuddering crash. I rubbed my eyes. Yes, it was true. The earth seemed to be rising swiftly; the entire surrounding city was rising until the ground was almost level with my window. I suddenly became aware, however, that it was the building that was sinking, and not the earth that was rising. I felt no downward surge because I was already on the level to which the earth now appeared to come.

Suddenly the sound of the dynamo behind me ceased, and I turned in apprehension. To my joy I found that I could touch it, and hastily unscrewing the cover, I crawled inside. Replacing the cover by means of a handle on the inside, I hurriedly splashed some of the waxy substance over it and turned to the switch. Through the glass walls I caught a last glimpse of the now smouldering ruins, before I turned the current on. The dynamo had barely started to hum at full speed before the switch was mysteriously turned off again. Knowing that the scientists had turned it, finding their journey resumed, I again threw it over and clung desperately to it to prevent it from being turned off again. I watched the dial on the wall; the hands were speeding around their tracks; twenty thousand years, twenty-one—twenty-two—twenty-three, and continuing on up to thirty-four thousand years. Here I released the switch, as I knew that my time was seventeen thousand years into the future and taking into consideration the seventeen thousand that the scientists had already traveled, I reasoned that at thirty-four thousand I would be in my own time. A strange weariness seized me and I had barely strength to open the glass door and crawl outside before I succumbed and sank to the floor.

The Desolate Hall

THE room was just barely glowing with the pink tint of sunrise, when I staggered to my feet with a groan of agony as a sudden surge of dizziness swept over me. I walked unsteadily in a sort of sideways stagger until the dizziness abated and I could orientate my senses to my surroundings. I stared uncomprehendingly about the room, noting the thick layer of dust, crossed by footprints that led about the hall with no seeming purpose, crossing and recrossing as they traced their way about the hall. My mind was gradually emerging from the fog that had engulfed it and suddenly it all swept back to me: the pit of the Interiorists, the attack of the Preventists, and the cataclysm that had resulted in the destruction of Jandra.

These footprints in the dust of the floor were my own, made before my memorable experiment with the discboard controlling the tubes. All at once the thought of the globe that had brought me back in time entered my mind, and I stared about in search of it. There was no sign of it nor of any of the other apparatus. I suppose it had gone, under the guidance of the scientists, into new realms of time. As I stood thinking of the events through which I had passed, with my eyes bent to the floor, my attention became riveted on one of the footprints on the floor before me.

A low cry of astonishment escaped me; these were not new prints! They were covered with a layer of dust a full inch in depth and I noted with swift realization that all about me was uniformly covered with the dust, with no evidence of disturbance for years except the spots that marked the place where I had emerged from the globe and the spot where I now stood. The niches in the wall were shapeless piles covered with dust. Shapeless piles! Where were the tubes? Scraping away the layer of dust on the floor near one of the niches I found the remains of the tubes; shattered fragments of glass and bent and twisted remnants of metal electrodes. The operation of the tubes after so many centuries of inactivity had doubtless proved too much for them and they had collapsed.

Selecting several heavy pieces of the metal electrodes, which I found to be of platinum, I left the hall, giving but a passing glance to the large circle on the opposite wall. It too, had collapsed and one half lay in dust-covered fragments on the floor while the still hanging part leaned uncertainly outwards. I turned my back on this only remaining fragment of the vast works of the city of Jandra and advanced down a long corridor out into the blessed dimness of my own sunlight: blessed indeed, for it furnished the best proof that I had returned to my own age! I stood for a moment gazing at the surrounding jungle and the few miserable piles of grass-grown ruins that were all that remained of the mighty city of Jandra, and as my gaze returned to the ground at my feet I saw something that looked like a rusty pick. It was my pick—the one I had found in the wreckage of the *Merida!* But what had happened to it? Every vestige of the wooden handle had disappeared and the head was so badly rusted that it fell to pieces when I touched it. How could a pick rust so badly in the short time I had been in Jandra? Why, it was barely a month ago, according to my reckoning, that I first stepped from the jungle at the edge of the city and deposited the pick at the doorway of the building next to which I now stood.

Giving the problem up in perplexity, I began the journey to the coast. All went well for two days, and then on the third day I met with an accident that nearly proved my death. Rounding a turn in the trail, I came full upon a huge lion. With a startling roar, he charged straight for me. Clutching my pistol in my hand, I let the beast have it, firing the entire six shots before the charging lion toppled over at my feet, knocking me over with the momentum of its dead weight. White and shaken, I rose to my feet and surveyed the body. I shuddered as I noted the gaping jaws, the curving claws and the yellow teeth that had so recently been gaping to rend me. I again took up my journey to the coast, although not in such high spirits as before. I was continually darting nervous glances into the underbrush at the edge of the trail, on the lookout for more of the man-eating beasts. I now had no means of protection and threw the useless pistol away to lighten my burden. I was still subject to occasional fits of dizziness and frequently had to stop and cling to a tree bole while I waited for my head to clear.

FOUR days later I reached the coast, coming out of the forest onto the same beach from which I had set out, five weeks before. But it was changed! The two trees at the head of the promontory were mere rotting stumps and of the boxes and barrels there was not a sign. These indications of seeming age perplexed me greatly, and I pondered over the matter as I sat on the sand to decide what to do. As I sat there I noticed a smudge of smoke on the horizon. It was a ship, and was headed straight for the little harbor. In two hours it had come close enough to anchor, and just as night fell I heard the anchor chain being paid out.

I spent a restless night, and in the morning attracted attention by waving and shouting. Soon a boat put off and

headed for shore. Half an hour later I was aboard the *Havana Shipper* bound for Havana.

When introductions were over, the captain asked how I had come to be stranded on such a lonely coast. When I explained that I was the only survivor of the *Merida* which had sunk off this coast about five weeks ago, his eyes opened wide and he looked at me as if I were mad. Finally he managed to stutter, "Five weeks ago! Why man, the *Merida* went down thirteen years ago; in fact on Christmas day, 1944. It is now August 22, 1957."

I straightened as though I had been struck a blow in the face. Thirteen years! It was entirely too incredible. Gradually a realization of what had happened came over me. The machine in which I had returned from Jandra had operated a little too long. I had taken it for granted that the first scientist had gone exactly seventeen thousand years into the future when he had in reality gone a few years less. Therefore my calculations had been thirteen years off. But I was the gainer. Thirteen years had passed without my becoming any older! To find myself only twenty-seven years old in a year that should see my fortieth birthday was novel, to say the least. I decided to tell the captain nothing of my experiences. He would consider me crazy, and I certainly was as sane as anyone.

Several days later I landed in Havana, and from there took a ship to San Francisco. Further upstate, I found a wonderful little chicken farm and purchased it with the money I had realized from the sale of the platinum electrodes of Jandra.

Soon after settling down, I was the recipient of a visit from two men who introduced themselves as the former owner of the *Merida* and a friend of his who had decided to accompany him on his quest for information of the fate of the *Merida*. In some manner, the news of my reappearance in civilization had reached him; and as I was the only survivor, he had decided to visit me and learn what had really happened to his ship. Its disappearance, he told me, had been accounted a mystery until pieces of wreckage had been found off the African coast.

Bidding him be seated, I plunged into an account of the wrecking of the *Merida* and when I had finished, he sat thinking for a few moments and looking at me sharply asked, "And where have you been during the past thirteen years? Not that I wish to be inquisitive, but my companion here has heard of a certain statement of yours which you made upon your rescue. You seemed thunderstruck when you were told that thirteen years had passed since the sinking of the *Merida*. How did you come to believe that it was only five weeks? Perhaps it is none of our business, and then perhaps it is. We are waiting."

I debated for a moment the wisdom of telling these men my story. They would disbelieve it anyway. Then the thought of the priceless treasure of platinum that lay on the floor of that dust-covered room decided me; and I began my story while the two men listened intently. When I had finished they sat back and the owner of the *Merida* laughed aloud. Not so his companion, who sat with gradually growing belief plainly outlined on his countenance.

"Just where is this ruined city?" he asked, and upon receiving the information he calmly stated that he was going to Africa to find the platinum electrodes. His companion stared at him in amazement. "Are you crazy?" he began, but was silenced by a sharp look.

THE scientist, for as such he now announced himself, asked sharply, "Do you know anything of physics?" When I replied in the negative, he nodded his head.

"I thought so. Then you would undoubtedly like to know just what happened to you in that globe, and what happened in the room full of tubes when you first made your journey into the past. Both of the tubes you describe, are, as nearly as I can determine from your rather hazy descriptions, giant variations of the Crookes tube.* The round globe by which you made your return was one of the more familiar types, but, as I see it, used a ray similar to the cathode ray but having a vastly different action.

"As for the tubes that took you back in time, I have not much to say. It is probably a form of Crookes tube or perhaps a Geissler tube. What the scientists of that nation did was to flash the purple 'Time Ray' on the tubes and speed up the motion of the particles in the tube so that they vibrated at such an enormously fast rate that they changed their position with regard to time."

The scientist rose to his feet to signify the interview was at an end, and, bidding me good-by, departed with his companion. I wondered whether he would find the city and whether the platinum would still be there. Or would he perhaps stumble upon an even greater adventure than I had found: an adventure in the future with the three scientists who are now without any home except a desolate, lava-spattered landscape with here and there a building still partially standing like the larger bones of a shattered skeleton. Two years have now passed, and I have had no further news from this scientist. He has not returned. Will he some day come to my little cottage with a story to rival my own? I often wonder.

* A vacuum tube—an early form of X-Ray tube.

THE END.

What Is Your Knowledge?

Test Yourself by this Questionnaire

1—What do the antipodes of a place mean? (Page 8)

2—What is the theory regarding the temperature within the earth as compared with that on the surface? (Page 10)

3—What is the speed of a magnetic field? (Page 26)

4—What is the speed of sound through air? (Page 27)

5—What is an "atmosphere" of pressure equal to? (Page 41)

6—What is "battery gas" and what is its effect on the human system? (Page 42)

7—What significance has the number ninety-two in chemistry? (Page 48)

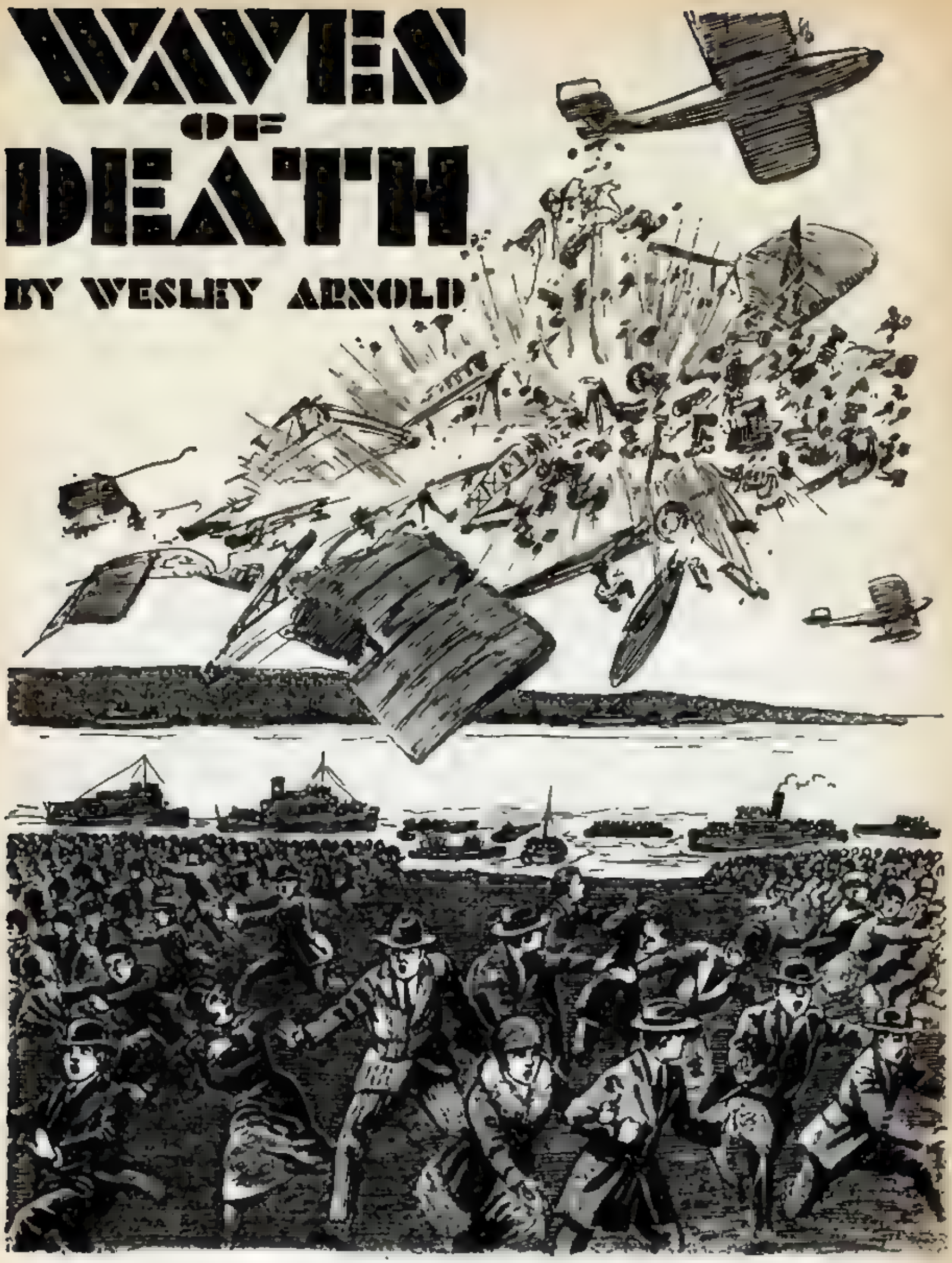
8—What kind of an electric charge has an ordinary atom? Why? (Page 53)

9—What is the meaning of the frequency of a wave? (Page 64)

10—How does the frequency of a sound wave vary if the source is moving away from an observer? If it is moving closer? (Page 64)

WAVES OF DEATH

BY WESLEY ARNOLD



(*Illustration by Paul*)

Without warning of any sort the American plane was seen to disintegrate in the air. It broke into a thousand pieces that fell in long curves to the crater.

THE annual Schneider Cup race is rightly considered the world's most colorful and exciting spectacle. As long ago as 1929 nearly two million persons gathered along the banks of the Solent in the south of England to watch the winning of the cup for Great Britain with the then amazing speed of 328 miles an hour. The tremendous strides made in aviation in the two decades added equally to the importance and to the public interest with which the annual seaplane contest was regarded.

The 1948 race having been won by the United States, the duty of arranging the 1949 meeting and acting as host to the competitors fell to this country. Unusual secrecy attended the preparations of the two chief competitors, England and the United States. Already a month before the date set for the race, November 18, interest ran high throughout the world, while among the English-speaking peoples excitement and partisanship were at fever pitch. It was taken for granted that the record of 650 miles an hour made the year before would be broken, probably by flyers representing both nations, but which would triumph? France and Italy had also made entries, but the victory was generally conceded to lie between the English and American contestants.

WESLEY ARNOLD

American hopes were divided between Lieutenant Alfred J. Burton, holder of the world's record, and his close friend, Lieutenant "Jimmy" Wallace, a pilot of exceptional daring, but one who seemed eternally dogged by ill luck. Jimmy Wallace's sunny and care-free disposition had endeared him to the whole natson, and there were many who hoped that he, rather than his comrade, would emerge from the race on top. In a way he deserved the honor because of his bad luck in the 1938 race, when he was forced down by engine trouble after completing the first lap at the rate of 646 miles an hour. The two British pilots, Flight Lieutenant Richard Olerich and Flight Officer Ronald Briggs, were also well known to race enthusiasts. Two weeks before the date of the race the French decided not to participate, leaving only a fifth contestant, the Italian, Lieutenant Alborelli

November 18 dawned clear, and developed into a perfect Indian summer day. All the preceding night special air liners had brought people by the hundred thousand from New York, Philadelphia, Washington, Chicago, and intermediate points. By early morning all available parking space had been taken by planes small and large, mostly from Baltimore and the surrounding country although registration members from every state in the union could be picked out. The shores of the Chesapeake were black with massed humanity hours before the start of the race. Water craft of every description dotted the river — gray men-o'-war, cruisers and destroyers, majestic ocean liners, sleek and beautiful yachts——all with their decks crowded with holiday-spirited passengers. Speed boats shot in and out between the large vessels, adding motion and gaiety to the scene.

At one o'clock President Smith and members of his official party passed through the cheering multitude and went aboard the flag ship *Texas*. The race officials and a select few of the aviation experts took up their place at the start-finish line of the 31-mile closed course. The five planes which were to compete were towed out to midstream to be in readiness for the start one hour later.

The British planes were remarkable for their almost complete lack of wings, having barely enough wing surface to lift them at high speed from the water. The American planes rested low in the water, in contrast to the others, which sat on their pontoons as if on stilts. Ultra-streamlined, the American planes appeared trim and competent. Only experts realized the remarkable work of the designer which made that trim appearance possible. The fifth seaplane, marked with the Italian colors, offered nothing novel in design.

A Thrilling Race

THE air was cleared of the hundreds of planes which had been droning and circling overhead at 1:30 o'clock, and the tensity of the five million spectators increased with the realization that the big event was rapidly approaching. At precisely two o'clock the loud speakers scattered through the immense crowd carried the word that Flight Officer Ronald Briggs was ready for the starting bomb.

Two minutes later the signal was given. The shining *LN*-4 sprang forward, picked up a speed of more than 100 miles an hour in a half-mile run on the water, and flashed over the starting line to open the long awaited race. Traveling through the air almost faster than the eye could follow, the sound of its motor rising to a high soprano shriek which struck the ear almost like a blow as it passed, the small British plane flashed down the straightaway and banked vertically around the pylon at the first turn. It was obvious to those near-by that the limit of speed man had hitherto been able to attain was being set a peg higher before their very eyes. This was confirmed when the official announcement was made over the loud speakers a few minutes later that Flight Officer Briggs had made the first lap at the average rate of 678 miles an hour and had attained the terrific velocity of slightly more than 700 miles an hour on the far straightaway. It was more than most of the observers had bargained for, and the confident assurance of the crowd in the American flyers was considerably dampened.

Twice more the speed marvel shot around the course, and as it flashed by the official barrier at the end of the third lap the bomb sounded for the first American starter.

A thrill ran through the crowd as its hero, Lieutenant "Jimmy" Wallace, took his plane gracefully into the air after a short run and flashed by the barrier. Could the *Dart* compete with the "*LN-4*" on equal terms? Would Jimmy be able to better the record set by the courageous Briggs on the first lap and maintained for almost half the seven

IT is well known that sound or sound waves have very destructive effects on man-made structures. For example, it has been stated that if a violinist were to play continually a note on his instrument which was attuned to the natural period of vibration of the particles of a great building, he could cause the building to collapse!

Another instance of this is the ability of a troop of men, marching in step, to destroy a strongly constructed bridge by producing a continual vibration of the same frequency.

It is evident that the question of vibration is one which airplanes must contend with more and more as higher and higher speeds are sought.

Inasmuch as the mystery that surrounds the incidents of this story are so unique, we cannot give the reader any further hints. But we wish to say that the events that occur, which mystify the world and lead almost to an international war, form the basis of a most unusual story.

laps of the race? Had his steady run of bad luck broken at last?

The answers to the first two questions were quickly given. When the *Dart* passed the starting line the *LN-4* was at the far turn, a third way around the course on its fourth lap. Lieutenant Wallace lived up to his reputation for daring. The *Dart* cut the first pylon considerably closer than the other plane had done, literally mushing through the air as it banked squarely on its side. Without straightening it in the slightest, and relying solely on its velocity and the pull of its propeller to keep it in the air, the Navy ace shot over the short course to the second pylon, rounded it similarly and then leveled off for the straight drive down the far side of the course. To observers under its path, the *Dart* lost its identity as a plane and became a silver streak through the air. First a distant speck, it arrived overhead as a silver flash of light accompanied by a shrill and terrifying roar, which changed to a droning bass as it passed, and then instantly became a distant speck again. When the first lap was completed, "Jimmy" had cut down more than half the distance separating him from his opponent. His speed on the first lap was announced as 704 miles an hour, while he had made the unprecedented record of 730 miles an hour on the straight course!

What happened next will be described as it was witnessed through binoculars from the official stand under the start-finish line.

Lieutenant Wallace again saved time on the turns and rounded the second pylon at the western end of the course only a short distance behind his opponent. With the two planes separated by only a short distance the difference in speed was apparent, and there seemed no doubt that the *Dart* would pass the *LN-4* on the straight run to the eastern end of the course. At the center of the straightaway only some 200 yards separated the competitors, with the *Dart* making close to 750 miles an hour and rapidly overhauling the *LN-4*.

Then, without warning of any sort, the American plane was seen to disintegrate in the air! The sturdy seaplane, which had withstood the severest laboratory tests, broke up into a thousand parts that fell in a long forward curve to the water. The *LN-4* just ahead was seen to rock violently, but then steady itself. A second later a terrific roar, bringing its testimony at a much slower rate than that of light, told how the shrill sound of the *Dart's* motor had been enveloped in the reverberations of a tremendous explosion, from the effects of which the near-by British plane had barely escaped.

CHAPTER II

Angry Accusations

THE sorrow of the American public over the death of its favorite was intense. It was alleviated only in a small degree by the fact that the prized Schneider Cup had been retained for the United States by the victory of Lieutenant Burton when the officials hastily decided not to interrupt the race. But proud as every American was over the retention of the trophy, there was not a citizen of the United States who would have regretted its loss if the life of Jimmy Wallace could have been restored thereby

But national resentment was aroused to its highest pitch the following morning when the belief gained general acceptance that the supposed "accident" must have been the result of a deliberate plot. Newspapers carried interviews with aviation experts and naval officials who declared that the explosion of the *Dart* could be explained only by the theory that a bomb had been placed somewhere in the lane. Not only in America but all over the world anger flamed high against the unidentified culprit who would perpetrate such a dastardly act.

But the tragic occurrence was not entirely explicable on the supposition that a bomb, craftily placed to avoid detection, had exploded just at the intended moment. The theory, in fact, offered almost insuperable difficulties. How and when had the bomb been placed in the small seaplane? Like the others entered in the race, it had been under armed guard at every moment for several days preceding the race. Furthermore, how had the explosion been timed so exactly? If by a time bomb, then that bomb must have been placed in the plane on the day of the race, which was declared impossible.

The suggestion was advanced in some quarters that a small amount of a powerful explosive had been secreted in the plane when it was entirely overhauled three days before the race. The explosive, according to this theory, had been touched off during the race by means of a powerful ray of some undetermined nature which was directed against the speeding plane.

These theories, none of them satisfactory, only increased the public clamor for a thorough investigation of the tragedy, and swift punishment for the guilty. A means of carrying on the inquiry with the utmost thoroughness and the least possible delay through red tape was provided by the United States Senate, which promptly appointed an investigating committee. The resolution authorizing the appointment of the committee stated that its purpose should be to "take testimony of witnesses, inquire into certain rumors that have gained circulation, and by every possible means endeavor to bring to light all the circumstances attending and preceding the death of Lieutenant Wallace, or in any way bearing upon it."

CHIEF among the rumors referred to in the Senate resolution were two which had gained wide credence among the public, although they had no official sanction. The first was that a ring of gamblers who stood to profit by the elimination of Lieutenant Wallace had caused a time bomb to be placed in the seaplane, using as an intermediary a faithless guard whom they had bought over to their evil purpose.

The other rumor was treated with the utmost caution by the newspapers because of its serious international implications, but it was widely circulated among the general public. Its adherents believed that the death of their hero was the result of a huge plot to enable the British contestants to win the race. They believed that only through a miscarriage of the diabolical plan had Lieutenant Burton escaped a similar death and emerged victorious from the race.

Such was the seething condition of the public mind when the Senate investigating committee met for its first hearings. The first witness examined, Secretary of the Navy Warren, produced the departmental records covering the preparation for the race. It was revealed that both the *Dart* and the *Arrow*, its sister plane, had been given exhaustive trials in which both had exceeded 700 miles per hour on a straight course. In laboratory tests their ability to withstand the strain of much higher speeds through the air had been demonstrated beyond question. Secretary Warren also gave the details of the elaborate guard which had been maintained over the two planes. He was then excused and Lieutenant Burton took the stand.

The principal part of the pilot's testimony concerned a thorough examination of the *Arrow* made by mechanics under his direction and observation following the race, in which he had set a new world's record. The examination, he declared, showed that the *Arrow* had not been tampered with in any way.

"What was the condition of the plane after the race?" asked Senator Carter, who was chairman of the investigating committee.

"We found that the bolts holding the motor in place had been slightly loosened by the vibration. Otherwise everything was in perfect condition."

"Was that loosening of the bolts expected?"

"Yes. The vibration of the motor at high speed is very great," replied the noted pilot.

"So that your examination of the plane showed nothing that

was unexpected?"

"No."

As the committee chairman concluded, Senator Billings, a member from a western state, put a question:

"What were your relations with Lieutenant Wallace?"

"He was my best friend," the witness replied in an even voice.

Senator Billings stood for a moment looking into the eyes of the witness with a slight sneer on his face, and then resumed his seat. Lieutenant Burton was excused and his place was taken by Chief Petty Officer Lansing, who was in command of the detail assigned to guard the *Dart* on the night preceding the race. The preliminary questioning over, Senator Carter asked:

"Did any unauthorized person or persons obtain access to the seaplane's hangar on the night of November 17th?"

"No."

"Did you see any unauthorized person or persons in the near vicinity of the hangar during the night?"

The witness hesitated for a moment before replying.

"I don't know whether he would be considered privileged," he replied. "The only one I saw near the hanger was Lieutenant Burton."

Suspected!

SENATOR CARTER stared at the witness in surprise, and then cast a swift glance about the room. Lieutenant Burton, however, had left the room immediately upon being dismissed from the stand.

"Under what circumstances did you see Lieutenant Burton near the hangar?" he demanded.

"At about 10:30 that night," the Chief Petty Officer responded, weighing his words carefully, "I saw a small boat appear from behind the end of the hangar and quite close to it. I shouted to its occupant to come in to the pier and at the same time turned my pocket searchlight on the boat. Mechanic Greer, who was standing close to me, leveled his rifle at the man in the boat, but it was only a moment until we saw it was Lieutenant Burton. He was paddling a canoe."

"Did you report this?"

"No."

"Why not?"

"I didn't think anything of it at the time, after Lieutenant Burton explained that he was out just to calm his nerves. After the explosion of the *Dart* I remembered it of course, but I didn't want to say anything that would put the lieutenant in a bad light."

"Didn't you think it was your duty to report it?" demanded the inquisitor.

"I didn't know what to do," the witness responded.

Senator Carter turned and beckoned to a senate sergeant-at-arms. He whispered to the officer instructions which everyone in the room understood without hearing. The man left the room and everyone present knew as well as did Senator Carter that Burton was to be recalled and asked to explain why he failed to volunteer the information which had been left to the guard to reveal. As the chairman turned back to the witness, Senator Billings caught his eye.

"I should like the witness to explain why he thought it would put Lieutenant Burton 'in a bad light' if this nocturnal trip became known," he said.

"Why, I knew it might be misinterpreted," replied Lansing.

"Are you familiar with reports that Lieutenant Burton was envious of his comrade's popularity?" the Western Senator pressed on.

"I know they seemed to be good friends."

"But you have heard such reports?"

"Yes, I have."

"Do you know that Lieutenant Burton is a morose man, one who might magnify a supposed slight in his mind out of all proportion?"

"No. He is quiet, but he has always been perfectly fair to the man under him, as I know from experience."

"That is all I wished to ask," said Senator Billings, resuming his seat.

"Then that will be all for the present," Chairman Carter told the witness. "You will be subject to call later."

THE next witness was a race official who described the occurrence of the explosion for the benefit of the record, although most of the senators on the committee had themselves witnessed the tragedy. He had been on the stand almost an hour when the same sergeant-at-arms returned and spoke in a low voice to Senator Carter. After a few more questions the chairman excused the witness and turned to his colleagues.

"Gentlemen," he said. "Lieutenant Burton has just been arrested by the local police officials on a charge of murder. I do not know what information they have that we lack, but I think we may adjourn until tomorrow morning, when we can determine how best to proceed with the inquiry. If it is possible to do so we will have Lieutenant Burton produced here for further questioning at that time."

As Senator Carter left the building where the committee hearing was held, he was conscious of a feeling of chagrin as a result of the way the limelight had been stolen from him. An hour earlier he had been temporarily the most important person in the world as a source of news. Now, while he did not consciously phrase it so in his mind, he knew instinctively that in the morning newspapers the story of the Senate committee investigation would have second place. It was because of this that Senator Carter, who himself had been ready to press relentlessly the investigation of the circumstances connecting Lieutenant Burton with the death of his comrade, now felt a strong desire to clear the accused man. If he could succeed in clearing up the mystery otherwise it would be a double satisfaction, since he would be at one and the same time thwart the local police and recapture the spotlight of public interest and approval.

As Senator Carter entered his hotel a man arose from a chair and walked toward him. The man was below medium height, stocky and dark. The committee chairman's eyes brightened as he saw him.

"Hello, Lem!" he exclaimed. "What are you doing here?"

"Howdy, Senator," the stocky man drawled. "I'm workin' on this job. Got in yesterday and been scoutin' around a bit. Thought I'd compare notes with you."

Senator Carter was secretly delighted. He had had experience with Lem Short on other investigations, and knew him to be about the best of the secret service agents.

"Come up to my room," he said. "We can go over the whole case there."

CHAPTER III

A Serious Charge

THE Senator made his guest comfortable and then came at once to brass tacks.

"What have you dug up on the whole thing?" he asked. "You know that Lieutenant Burton has just been arrested, I suppose."

"Yeah, I heard about it," said Lem Short, in his customary slow drawl. "Maybe they got the goods on him, but I don't think so."

"Just my idea, exactly," Senator Carter declared. "When you look at the thing calmly, it's ridiculous to suppose that Burton is involved."

"Now don't get me wrong, Senator. I ain't sayin' Lieutenant Burton's hands is clean. Maybe he knows more than he ought

to about what happened. What I said is, I don't think the police here know as much as I do, and I don't know near enough to hang Lieutenant Burton or anybody else."

Senator Carter considered this for a moment.

"What's back of the whole thing, Lem?" he asked. "What's your idea about it?"

"That's a big order, Senator," the secret service agent drawled. "I don't know as much about it as I'd like to—not yet, but I sure will. And I think when I do get to the bottom of the mess you'll find it goes pretty far—farther than you'll be willin' to follow it, maybe."

"We're out to clear this thing up," Senator Carter retorted, "no matter how far it goes. But what, exactly, do you mean?"

"Suppose a foreign government is involved—officially?"

The senator looked at his guest speculatively.

"If that is true it might be a matter which would have to be taken up with the State Department," he admitted. "Have you any proofs?"

"Nothin' that'll stand up. There's a thousand rumors, and some of 'em ain't all hot air. I've found that out, anyhow."

He paused for a moment to light a cigarette, and continued with more animation.

"Here's how it looks, Senator. This foreign government we're talkin' about—you know which I mean—wants the Schneider Cup. It's got two flyers entered—there, I've let it out! All right. Just how high it starts I don't know, but the British ambassador gets the word. Some way or other they reach Lieutenant Burton and he's rung in. But Jimmy Wallace can't be touched. He's out to win.

"HOW do I know all this, you'll ask. Well, it's like this. A week before the race Jimmy told two friends that an attaché of the British Embassy had approached him, very diplomatic like, tellin' him he could have anything he wanted if he'd finish behind one of the Englishmen. Jimmy didn't get the whole details. He turned the man down in quick order.

"That part's straight enough, but how about Burton? Well, the Englishman dropped a hint to Jimmy Wallace that Burton wouldn't figure in the picture—that it all depended on Jimmy. But so far I haven't found anything to connect Burton directly with any such agreement. It'd be a hard thing to prove in any case, you see, because nobody that's involved in the agreement could afford to admit it."

"But don't you see where the whole thing falls down?" Senator Carter interrupted. "Burton didn't throw the race. He won it."

"Yeah," Lem Short said slowly. "I know. Sometimes human beings sink pretty low under the influence of jealousy and greed. What do you make of this fact? For a week before the race a lot 'o the so-called 'wise money' of New York gamblers was being offered on the British flyers winnin' the cup. Then the day before the race they all began coverin'. And instead of bettin' on the United States keepin' the cup they were gettin' double the odds by puttin' the money smack on Lieutenant Burton to come in first."

Senator Carter gasped.

"You think that Lieutenant Burton first agreed to 'throw' the race, knowing that Wallace was to be killed, and then doubled-crossed the conspirators by selling out to a ring of gamblers?"

"Why not?" the secret service man said in a matter-of-fact tone. "As far as that went he was safe. Nobody could 'squeal' on him. And maybe he didn't know Jimmy Wallace was to be killed. Maybe it wasn't ever planned for him to be killed. It would have served the same purpose, you know, if the seaplane had been destroyed just before the race. The only thing about that is that Jimmy Wallace may have known so much that he had to be put out of the way."

Lem Short reached for his hat, and stood up.

"You understand, Senator, that I'm tellin' you things I couldn't say in court for lack o' proof. That's the line I'm working on, and if you can make any use of it you're welcome."

As he was turning the knob of the door he stopped to ask a question.

"By the way," he said, "who's this guy, Gray, that's snoopin' around?"

"I don't know whom you mean," replied the senator.

"Now? I supposed he was workin' for you, though I don't know what good a college professor is on this job."

"A college professor? Who is he?"

"Oldish gink named Charles Gray. He's been around a couple o' days. Was out this afternoon to look over the *Arrow*. He must have some pull, or he'd never have got that far. Since he's not workin' for you I'll look him over. I guess he's harmless."

After Lem Short ambled out with the promise to report any definite developments, Senator Carter sat down to think over the case. Could it be that the secret service agent was near the truth in his suspicions of double-deep treachery involving Lieutenant Burton with a ring of gamblers and with some representative of the British government? If the latter were true, it was a matter to be handled with the greatest care. With public feeling as high as it was, any official sanction of the rumors of British responsibility for Jimmy Wallace's death would be a match set to a powder train. Where a positive disclosure of such a fact would lead no man could say. Certainly the matter must not be even hinted officially without positive proof; and even if it were true, could the fact be established? Senator Carter knew Lem Short to be a very thorough investigator. He might go off on the wrong trail but he would follow it to the end, and, finding it wrong, he would go back to pick up the right scent. On the whole, Senator Carter was well pleased to know the secret service man was on the job.

CHAPTER IV

Burton Explains

LIEUTENANT BURTON, haggard after a sleepless night, was arraigned before a committing magistrate the following morning. A sailor who had been on guard testified to the nocturnal visit which the senate committee had learned of the preceding day. He added the statement that the lock on the sea end of the hangar showed signs of having been tampered with. A police officer then told of a visit to Lieutenant Burton's rooms and the discovery there of a bottle containing dynamite.

On this evidence, which his attorney characterized as ridiculous, Lieutenant Burton was ordered bound over for the grand jury.

At the flyer's own request, however, the magistrate gave instructions that he be permitted to go before the senate committee again, and he was accordingly taken from the courthouse directly to the room where the committee was waiting to begin its session.

In addition to the committee members and stenographers the room was crowded with newspaper reporters and as many persons as could jam themselves into the space provided for the public. The accused man entered with his head erect, and took the seat pointed out.

"Lieutenant Burton," began the committee chairman. "There has been testimony here that you were seen on the night preceding November 18 in the vicinity of the hangar where the *Dart* was kept. Is that true?"

"Yes," the accused man replied in a colorless voice.

"Now, why did you fail to mention that fact when you were examined here yesterday?"

Lieutenant Burton straightened in his chair, and looked about him defiantly before answering.

"Because it had nothing whatever to do with the subject of your inquiry. For the same reason," he added bitterly, "I said nothing about having in my room an explosive mixture consisting partly of dynamite, with which I had been experimenting on a small rocket motor. However, since these things have been seized on to prove that I murdered Lieutenant Wallace, I am willing to tell you anything I can."

"Can you throw any light upon the explosion of the *Dart*?"

"No. That is as complete a mystery to me as it is to anyone. If I knew anything that would aid you in that respect, I would have told you about it yesterday.

"Suppose you tell the circumstances of your canoe ride."

"I will tell you exactly what happened, but it is so simple that I do not expect you to believe me. The whole world seems to have gone crazy, or it would never have believed that I had anything to do with the death of my comrade.

"Lieutenant Wallace and I occupied rooms on the same floor of the Wilson Hotel. On the night before the race I was feeling nervous in anticipation. I was not afraid of anything, because I had tried out the *Arrow* thoroughly and knew it was in perfect condition. It was just the strain of waiting and anticipation of the race that was affecting me. I knew this would leave me as soon as I entered the cockpit for the race, but still it was important that I get a good night's rest, and I was afraid I would not.

"About nine o'clock Lieutenant Wallace knocked at my door and came in. He seemed perfectly calm and not at all disturbed by the emotions that affected me. However he saw that my nerves were on edge. He suggested that I go down to the river and row or paddle for an hour or so and then go directly to bed. I realized that his advice was good, and so I took it. I was paddling back to the pier when I made a mistake, found my bearings, and was about to pull out again when I was challenged by the guard."

DURING this recital an attendant approached Senator Carter and handed him a penciled note, which the chairman glanced at and then continued to hold in his hand. Senator Billings, whose belief of the aviator's story was evident by his expression, looked at the chairman inquiringly at this juncture, but received no enlightenment.

"I identified myself to the officer in charge of the guard," Lieutenant Burton continued, "and then paddled directly back to the pier I had left an hour or an hour and a half before. When I returned to the hotel I saw a light in the room occupied by Lieutenant Wallace, and knocked at the door. He was reading. I told him that his prescription had had the desired effect, and then went to my own room and retired. I have told you all that occurs to me about the matter, but I will be glad to answer any questions."

Senator Billings rose slowly to his feet, but the nimble chairman of the committee was ahead of him.

"If you will pardon me, Senator," he said apologetically.

Turning to the witness, Senator Carter said:

"We may wish to question you in a few moments, Lieutenant Burton. In fact, I am sure some of the senators are not entirely satisfied with your testimony. However, I am going to excuse you temporarily, while we listen to the testimony of another witness."

"I protest against this dismissal of the witness at this time," Senator Billings began. "Surely we should examine him thoroughly now when we have the opportunity."

"Lieutenant Burton will remain in the room under guard of the sergeant-at-arms and of the policeman assigned to guard him," the chairman replied. "Before we go ahead with his testimony I think we should hear another witness who is present. Dr. Smith, will you take the stand, please."

A middle-aged man, whose scholarly appearance was increased by the gold-rimmed spectacles which he wore, walked forward with a firm step and assumed the seat vacated by Lieutenant Burton. He cast a friendly glance about him at the assembled senators, newspapermen and audience.

"There Was No Explosion!"

SENATOR CARTER, always the showman, was obviously pleased at having the opportunity to introduce this surprise witness. It was clear he wished to make the moment as dramatic as possible.

"You are Dr. Charles Andrews Smith?" the chairman inquired formally.

"Yes."

"Head of the Physics Department of the University of the East?"

"I have the honor to hold that chair."

"You are known throughout the world, I believe, as an authority in matters of physics, particularly in the field of that science devoted to the study of atoms?"

"Really, Senator," protested the witness, who seemed embarrassed and annoyed, "you place me in a difficult position."

A member of the committee came to the witness' aid.

"The eminence of Dr. Smith in his own field is well enough known not to need confirmation from his own lips," he remarked dryly.

Having properly stressed the importance of the witness, Senator Carter turned to the business of the committee, that is, to investigate the death of Lieutenant Wallace.

"In this note which was passed to me, and which bears your name, Dr. Smith, you say that you can explain the explosion of the *Dart* which resulted in the death of Lieutenant Wallace. Do you mean that you know what caused the explosion and the circumstances of it?"

"Did I really write 'explosion?' the witness said in surprise. "I scribbled the note in haste, but I should not have been so careless."

Senator Carter hastily consulted the piece of paper which he held in his hand and then said in some confusion:

"No. You did not use the word. It was my own. However, I . . ."

"Ah, you relieve me," the witness interrupted, with a smile. "You see, there was no explosion."

"But I do not understand you," Senator Carter protested. "Five million people saw the plane explode!"

"Perhaps I overstress a technical point," the eminent scientist replied. "Nevertheless I must insist that there was no explosion, but there was instead a very curious and unique occurrence which resembled one."

Lieutenant Burton had been watching the surprise witness intently. At this unexpected statement he glanced momentarily at the police officer at his side, and then again concentrated his attention on the scientist. If he knew what was coming he showed no sign of it.

"Will you please explain what you mean?" Senator Carter requested.

"I trust you gentlemen will forgive me if I seem to adopt a professorial manner in my explanation," the scientist began, engagingly. "As I said, what happened to the seaplane, *Dart*, with its tragic consequence, was so strange that possibly no one else has hit upon the true fact. I say this without any conceit, because the truth is so simple that any student of physics would need only to be set on the right track of inquiry to arrive at the same result I have reached.

"Nevertheless, the solution of the mystery was not easily arrived at. If it were not for the fortunate fact that I am at present engaged in certain experiments concerned with acoustics* I feel sure that I, at least, should not have hit upon it."

* The study of the properties of sound.

DR. SMITH hesitated for a moment, and then turned to Senator Carter.

"Since I am not addressing an audience of fellow physicists," he said, apologetically, "I feel that I should go into some detail, so that you may follow my explanation exactly. Can you grant me the necessary time?"

"You have declared that you can explain the cause of the explosion—or whatever it may have been," the committee chairman responded. "In view of that, and of your eminence as a scientist, we naturally will gladly give you all the time you require."

"Thank you," said the witness, gratefully. "I will try not to tire you too much.

"I wish first to mention something which was noticed by most of the persons who witnessed the race. Most of them probably did not understand the cause of what they noticed, although it is quite simple. I refer to the fact that when an airplane is approaching at high speed its motor has a high, soprano tone, but when the plane is going away from the hearer the note of the motor is much lower in the scale. The same thing on a smaller scale may be noticed in the whistle of a train which is approaching or receding from the hearer at high speed.

"We all remembered from our school-books, of course that sound consists of a wave motion. Musical notes are caused usually by some vibrating object which causes waves of a definite frequency, and it is the frequency that determines their pitch. If the object vibrates rapidly the frequency of the waves is high and so is the pitch of the note which the ear distinguishes. If the object vibrates slowly, the frequency of the waves and the pitch of the note is low. These waves, I should mention, travel through the air at the rate of 1,090 feet per second.

"Now the sound of a motor is caused by individual explosions of gas in its cylinders, the separate explosions occuring so rapidly that their repetition at regular intervals causes what we can recognize as a musical note. The pitch of the note is determined by the frequency of the explosions, so that when the motor is running at high speed the pitch is high. As the speed of the motor is decreased the note becomes lower and lower until finally it ceases to be a musical note at all, and we can distinguish the separate explosions.

An Amazing Discovery

"THE condition that I have described, however, applies only when the motor and the hearer are at rest relative to one another, as when the seaplane, for example, is resting on the water and the hearer is also at rest. In these days of 'relativity' we have learned also to consider what happens when the observer and the observed are in motion relative to one another. From that viewpoint it is clear that when the airplane is approaching the observer rapidly, each separate explosion in the motor occurs a little nearer to him than the last, with the result that the sound waves are crowded together. This is the same as saying that the frequency of the waves, as noticed by our observer, is higher, and therefore the pitch of the motor's note, as he hears it, is higher. When the plane is receding rapidly the waves are further apart; the frequency is lower and the pitch of the note which he hears is lower.

"I should point out that the pilot of the plane, who is at rest relative to the plane because he shares its motion, detects no such difference in pitch. The motor sounds just the same to him in motion as it would if the plane were on the water, except that it does not sound quite so loud, since the waves have to travel somewhat further from their point of origin to catch him, and consequently are somewhat spent—that is, they have lost some of their intensity."

Dr. Smith paused and looked about him to make certain that he was holding the attention of his listeners.

Senator Billings, apparently, had been awaiting the opportunity.

"All this is very interesting," he growled, "but this is not a class room in physics, and I fail to see the connection between what the witness is saying, and the explosion of the *Dart*, which it is the purpose of this committee to investigate, as I understand it."

"Dear me," sighed Dr. Smith. "I thought I had impressed you with the fact that it was not an explosion. However, I possibly should apologize for going into this, to me, very interesting discussion. What I wished to say, really, was that I observed this phenomenon during the race and it was that which put me on the track that led to the solution of the strange occurrence which you insist upon calling an explosion. I will try to be more brief.

"You see, I too, was very much puzzled to explain what happened. By a very fortunate chance it happened that I was aboard a friend's yacht almost under the spot where the *Dart* met with its unfortunate end. I had been noticing the peculiarity which I mentioned in the sound of the British plane. As it approached on each lap the sound of the motor was quite high pitched. It rose from a murmur in the distance to a shriek of great intensity as the plane approached directly overhead. Immediately it changed to a bass note as the plane passed, and rapidly faded to a murmur again. That happened on the first three laps which the *LN*-4 made around the course. On the next lap I again noticed the phenomenon in the case of the British plane, and also in the case of the *Dart*, which was close behind.

"It was quite exciting on the next lap, the fifth for the *LN*-4 and the second for the *Dart*. The two planes were very close together as you undoubtedly recall. The *LN*-4 approached with the same shrill sound, which changed to a low note as it passed overhead. But there appeared to be something wrong with the *Dart*. I listened for its high tone above the low note of the other plane, and there was a fraction of a second when I should have heard it quite distinctly.

TO my amazement there was not a sound from the approaching plane! It was just as if its motor had stopped dead, and yet that was impossible, because it was visibly overhauling the *LN*-4. Of course, I had only a fraction of a second, as I say, to observe this most unusual phenomenon, but I am quite positive about it.

"The next moment my ears drums were almost split by a tremendous noise. The yacht trembled and I was thrown to the deck. At the same time I saw the seaplane directly above me fly apart. As I picked myself up, horror-stricken, as everyone was, I shared the general impression that there had been an explosion. But as I thought it over I was more and more impressed with the opinion that something much more unusual than a mere explosion had occurred. For one thing, I had noticed something peculiar about that tremendous sound. As I have said, I am engaged in certain research work in acoustics, and I have trained myself to distinguish between different sounds with great accuracy. It seemed to me that I had heard a single explosion in the cylinder of a huge motor.

"The explanation seemed almost within my grasp, but I could not quite catch it. Then suddenly it came upon me, and the simple answer explained everything—my failure to hear the motor of the *Dart* as it approached, and then that great sound which resembled one single cylinder explosion, greatly magnified.

"I made a rapid calculation in my mind, and the result made me positive I had found the solution. My calculation was simply to translate the speed of sound waves in the air, 1090 feet per second, into miles per hour. It works out to slightly more than 743 miles an hour. You, gentlemen, I see from your expressions, have begun to see the light. You have jumped

to the conclusion that the *Dart* was traveling at the exact speed of sound waves when it broke into pieces, and in that assumption you are undoubtedly correct. It remains only for me to explain exactly how sound waves, in this instance, became waves of death.

"As I tell you, the correct explanation of the accident occurred to me shortly after it happened, but not before the conclusion of the race. Otherwise I should have felt it necessary to try to prevent a repetition of it. Fortunately the accident was not repeated, and therefore we can safely assume that Lieutenant Burton, the winner of the race, at no time attained the speed of 743 miles an hour, although he must have come dangerously close to it at times.

CHAPTER V

Waves of Death

"IT remained for me to demonstrate by laboratory tests that my explanation was the correct one, and this I have done. I was handicapped by the inability to reproduce the conditions exactly, but I have nevertheless satisfied myself completely as to what happened.

"The phenomenon of sound reinforcement is well known and is utilized in some form in most musical instruments. If we set up in the laboratory two tuning-forks that vibrate to the same pitch, and strike one of them, the other will vibrate in sympathy. The resultant note will be twice as loud as if there were only one tuning-fork. Or if we have four tuning-forks of the same pitch and strike only one, all four will vibrate, producing a sound four times as loud, and so on.

"This is practically what happens in the case of an airplane traveling at the speed of sound waves. Instead of having a number of motors we have one motor which moves along with the original sound wave, reinforcing it with each additional explosion in a cylinder. The plane, of course, is moving through the air at the rate of 1090 feet per second, and if the explosions of the motor at high speed are, say, 500 explosions per second, then at the end of a second the plane will be accompanied by a single sound wave representing the accumulation of the waves, caused by 500 cylinder explosions. At the end of the second second it will have the accumulation of 1000 cylinder explosions and at the end of a minute there would be the terrible sound as from 9000 cylinder explosions.

"If the plane passed through this critical velocity of 1090 feet per second with a steadily increasing speed it would outrun the sound waves, and the pilot would not hear his motor at all, assuming that the exhaust is back of the cockpit.

"But the *Dart* had attained its maximum speed. It's velocity remained exactly that of sound waves, with the result that the sound of its motor was continually accumulating until it resulted in that tremendous roar which accompanied its disintegration."

The audience in the room, including the members of the senatorial committee, sat in dumbfounded silence as Dr. Smith ended his explanation. They were unable so quickly to give up their belief that some human agency had caused the wreck of the *Dart*, and the death of Lieutenant Wallace. Was it possible that the daring pilot's death had resulted from his flouting of an impersonal and immutable physical law of which he was not even aware?

A look of understandable relief, mixed with doubt, flickered across the face of the accused Lieutenant Burton. Assuming his own innocence of the charges against him, it was clear that he was as much mystified as were the others in the scientist's audience.

Senator Billings was the first to shape his doubts into words.

"What you say seems logical, so far as it goes," he admitted, addressing the witness. "I believe there is little doubt that the *Dart* was going about 740 miles an hour when this tragedy occurred, and the sound of its motor must have acted in the way you describe. Grant that, but you cannot expect us to believe that this strongly constructed and very sturdy seaplane was torn to pieces by nothing more than a big noise!"

"Why, no," Dr. Smith replied promptly. "Not by the noise. The plane was torn apart by the vibrations of the plane caused, or rather strengthened, by the sound wave. The destructive power of sound waves is proved in common experience by the breaking of windows and the rattling of dishes at considerable distances, sometimes miles, from the center of a severe explosion, even though the sound waves in such instances have already lost by far the greatest part of their original intensity. In the case under consideration, the *Dart* was directly in the center of the greatest intensity of the sound wave, and the plane moved on while the intensity of the wave constantly increased. It was necessarily only a matter of time until the strength of the wave became so great that the plane would be unable to withstand the strain.

"Moreover the seaplane was peculiarly subject to the destructive effect of that particular sound wave, because its parts were already vibrating to the frequency of the motor, 500 explosions per second, transferred directly through the rigid frame of the plane.

"It has often been stated that a violinist could cause the 150 story Empire Building to collapse if he could play a note exactly attuned to the natural frequency of the building. In the case we are considering, the seaplane, vibrating at the frequency of its motor, was literally torn to pieces by the force of the built-up sound wave and the increased vibration caused by it."

Dr. Smith's explanation of the tragedy ended the investigation by the senate committee. It was accepted by his fellow scientists, and furnished sufficient grounds for quashing the legal proceedings against Lieutenant Burton. As a result of the explanation of the death of Lieutenant Wallace, when such high speeds became common a few years later, airplanes were equipped with automatic signals to warn the pilot when his speed was dangerously close to the velocity of sound waves. When they received the warning signal, the pilots either decreased their speed or accelerated it very rapidly, so as to pass quickly through the critical velocities around 743 miles per hour. However, the death of Jimmy Wallace remains to this day unique in the annals of aeronautics.

THE END.

If you liked the "Shot Into Infinity" by Otto Willi Gail you will find a thrilling sequel to it "The Stone from the Moon" in the Spring SCIENCE WONDER QUARTERLY.

NOW ON ALL NEWSSTANDS

The Bat-Men of Mars

by Wood Jackson

(Illustration by Leonard)

As the creatures neared the craft it shot upward beyond reach. Meanwhile they laughed at the clumsy efforts of the Bat-Men.

THE BAT-MEN OF MARS

What Has Gone Before

Leonard Fry and Henry Randolph start off for Mars in a space ship built by Fry. Fry is a young but prominent scientist while Randolph is a capitalist. They have been friends for a long time. While on the way, Alicia, Fry's sweetheart, who has stolen into the ship as a stowaway reveals herself. They decide to allow her to continue with them.

They land on the surface of Mars and, as Alicia goes for a stroll, some strange winged creatures called Bat men suddenly descend and carry her away. A horde of them attack the space ship but the two explorers possessed of atomic disintegrators kill many of them and rise high into the air to avoid the others.

Alicia, meanwhile, has been taken to a cave by two Bat-men who begin quarreling over her. She takes this opportunity to escape and is picked up by a Martian airship. They take her to a great city and she perceives that the Martians are highly developed people, human beings like herself.

By means of a map she indicates that she is from the Earth and by pictures tells what has happened. The Martians allow her to try to communicate with the space ship by radio. She does this, establishes communication and tells her friends that a Martian ship is coming out to conduct them to the city.

When the space travelers come to the city, however, they are deprived of the ship and they see Alicia in a conveyance with a regal-looking man who turns out to be the Kor or King of Ovin. They are prevented for some reason from going near her.

They are finally taken under the wing of Horo, the science high priest of Ovin, the Martian nation they are in, and he tries to educate them in the language. He shows them a gigantic telescope in his observatory with a reflector a full thirty feet in diameter.

HORO was content merely to direct the telescope as his guest drank in the deepest draughts of astronomical knowledge any man of his race on the Earth had ever known. New theories raced through his mind as he beheld spiral nebulae magnified many times beyond anything he had ever seen. And then he speculated on the treasure of information he surely would receive from Horo, once they were able to communicate with each other through a common language.

Finally Horo grew silent, although he continued to serve the great telescope. Fry had become glued to the eyepiece of the instrument. But Randolph, sensing that the aged Martian was tired, suggested to his friend that they ought to retire.

"Can't we call it a day, Leonard?" he begged. "Horo surely will let you look at the sky again. It will be there tomorrow night, you know! I think the old fellow is about all in."

Thus recalled from the distant realms of space he was studying, the scientist now realized that he too was fatigued. It had been a strenuous experience, what with the untoward demonstrations upon their landing and his worry over Alicia's detention.

"Just one thing more, please, Randolph," pleaded the scientist. "I do want to know the size of this telescope's reflector."

Horo was instantly ready to satisfy this natural curiosity. He seemed to understand at once Dr. Fry's gestures as he tried to communicate his desire. But Horo first spoke to the flying captain, who now stepped forward.

Dr. Fry smiled. He had inferred that Horo thought it prudent to take this precaution, since the visitors from the Earth were utter strangers, albeit they possessed apparently as dependable a culture as had been developed on Turinia.

"He wants to make sure you won't smash it, Leonard," jested Randolph.

Dr. Fry laughed.

"And I," he declared, "would eagerly risk my life to protect it."

WOOD JACKSON

THE second instalment of this marvelous interplanetary story is by far more exciting than the first. Our explorers from the Earth are coming to grips with a strange civilization. Pitting their strength and ingenuity against the strange superstitions of another race, our author shows through page after page of this swift-moving tale that when interplanetary travel comes we must be prepared to meet all of its problems, no matter how strange or mysterious.

There is no doubt that such beings as the Bat-men could exist, or that nations like Avin would perpetrate such dreadful deeds. We understand from our author that he plans to take his interesting characters to Venus in the near future.

Now Randolph chuckled.

"And I have no doubt of that at all," he agreed.

Horo, with the Earth-men beside him, revealed the secret of the telescope's marvelous power. Dr. Fry fell back from the instrument in astonishment. The reflector of the telescope was fully thirty feet in diameter.

"No wonder, Randolph, Horo can bring the stars so close!" he exclaimed. "No wonder he can show us the outline of the continents on the Earth. No wonder we can see galaxies millions of light-years away. This thing magnifies almost beyond human belief."

Bidding good-night to the Martians, the Earth-men were once more in their apartment in the Por Lito. Randolph retired at once, but Dr. Fry sat looking out into the night, his thoughts awhirl with what he had seen. Sharp stabs of anxiety came every few minutes as he puzzled over the predicament in which he had found Alicia. He tried to look at the situation calmly, but the fact that he could do nothing until he discovered just what that predicament was, did not lessen his worry.

At last, however, the scientist composed himself, determined to take advantage of every opportunity for knowledge of the Martian language, habits and customs, in order that he might devise a plan for the girl's rescue. He had reached the conclusion that the dignified personage in the carriage with her was detaining Alicia

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against her will, yet something seemed to tell him that she was in no immediate danger. Although he did not realize it at the moment, he was influenced by the kindly conduct of his instructor. Horo, master of sciences and high priest of Osin, had made a good beginning.

CHAPTER X

They Learn Much

THE two flying captains called shortly after sunrise the next morning and took the Earth-men on an extended flight over the country in a small airship of great power and speed. They flew over waste lands that had been vast seas in ages past. They saw many cities from the air and lofty, rugged mountains covered with snow and ice, from which a system of canals led water to the various communities. Mars, as the Earth-men could see, was a planet on which water was rare. However, the Martians, or Turinians, seemed to suffer no hardship from this condition, which suggested that the shortage was not yet acute, and would not be, so long as their engineering skill could conserve it.

Ken Jari, who piloted the airship, suddenly swung away from a city somewhat smaller than Hio, taking them over a wide expanse of uninhabited land. No vegetation was to be seen here, but in the distance loomed a range of rugged mountains.

In a little while the Earth-men recognized the place they were swiftly approaching. It was Dir, where the Bat-men lived.

Ken Jari, who, as both men had discovered, was very skillful in handling his craft, skimmed over the top of the high wall and descended to fly inside the crater just above the ground. Now as he swept close to the grottoes the fierce Bat-men emerged at once. The creatures took the air and sought to intercept them.

Ken Jari laughed, and with him, Ken Mahu.

Randolph turned to his friend.

"It's their idea of sport," he observed.

"Well, it's hardly mine," said Dr. Fry, "yet it is thrilling to see the creatures. I should like to study them, but at a safe distance, of course."

Ken Jari played with the Bat-men. As the creatures neared the craft, he shot upward beyond reach, then as they dropped to a lower level he swooped after them. Meanwhile he and Ken Mahu laughed at the clumsy efforts of the Bat-men, with the habits of whom it was plain they were quite familiar.

As the flight continued, the Earth-men made a discovery that had escaped them before, so intent had they been on rescuing Alicia, who, they had believed, was still in the hands of the Bat-men. This was that the crater of Dir was but one of many such depressions and that a high wall quite enclosed the creatures.

Ken Jari flew for miles over various craters where they saw hordes of Bat-men. Daring to an extent that supplied many thrills for his guests, he continually swept to low levels in order to entice the creatures from their grottoes.

"Heavens, Randolph!" exclaimed Fry, "this is a nation in itself! There are thousands on thousands of these beasts!"

"But safely enclosed, Leonard. I've been watching them closely and I notice that none ever ascends to a height that equals the top of the wall."

"That's so," agreed the scientist, watching them more closely.

"And another thing," went on Randolph, "I haven't seen a break in the wall anywhere. In addition, what strikes me as somewhat remarkable is that this wall does not appear to be altogether a natural formation. It is too finished in places to have resulted from an upheaval."

"And what is your conclusion?"

"That the Martians built it to corral these beasts and isolate them."

"Oh, but that's impossible!" exclaimed the other. "They couldn't have built such a wall as this."

"The Chinese built theirs. And the Martians, as you often remind me, are ages older than we are."

The flying captains took them the full length of the Bat-men's country, and then set the course for Hio. Reaching the city, they went at once to the Por Lito, and after a repast of excellent Martian dishes they were escorted to the study room, where Horo awaited them.

For a week this program was repeated by the flying captains. That is to say, Ken Jari and Ken Mahu called for them early every morning and took them away from the Por Lito until noon. Both Fry and Randolph finally wondered just why this was done. They did not know, of course, that Horo, master of sciences and high priest of Osin, was devoting every forenoon to the education of Alicia by order of the Kor himself, and that their entertainment had been undertaken by the flying captains to prevent them from encountering her.

The Truth!

HORO'S method of teaching was simple but intensive. On the other hand, he found eager pupils. Dr. Fry, already a linguist, took to the Turinian language with such enthusiasm that within less than a fortnight after his arrival at Hio he and Horo could converse. Randolph, too, had made swift progress. Meanwhile, Horo had picked up even more of their English than they had learned of Turinian.

An agreement had been reached between teacher and pupils that speeded their progress. Horo was to speak only in English except when adding to their Turinian vocabulary, and they were to address him in his own language. In this way the advancement of all concerned was amazing.

At length, Fry asked Horo about Alicia.

"What, my friend, is the cause of her being taken from us?"

The Earth-man's voice betrayed the emotion and the excitement he felt. He and Randolph had often discussed the possibility of learning the true situation from Horo, whom they both trusted.

Randolph was present when the question was asked. He, too, showed a quick interest in the situation. Now they awaited Horo's reply.

"I may tell you now," consented Horo, brushing the white hair back from his noble forehead. "And it is your right to know. But first let me inquire what is

your relationship to the Sjorian* woman?"

"She is the girl I love," said Fry simply.

"Your wife?"

"No, merely my promised wife."

"Ah, that's different," declared the Martian. "I had hoped, my friend, since learning to love you that you were already married. But now, my son, I must tell you that the Sjorian maiden can never be yours. A virgin! And from another world! That was the prophecy! It is fate, my friend, and you cannot, must not, seek to change it."

The Earth-men exchanged swift glances, but neither spoke. They felt that Horo now would explain the mystery of Alicia's plight, but they could not know that the recital by the master of sciences and high priest of Osin should first hold them spellbound and should then challenge their best thought for solution of a grave problem.

"On Turinia,"* began Horo, "there are two peoples, two nations. Osin occupies about one-half the area of the planet that will support life. Avin occupies an area much smaller, and between them is Dir, the land of the Taga, or, as you know them, the Bat-men. All this is in the northern hemisphere, for a reason that you must by this time understand, the concentration of moisture at the pole and on the high mountain ranges in the form of snow and ice. Ages ago all Turinia flourished with many forms of life, as our museum of extinct species shows, and there was a high culture with many times the population of this day.

"It is only the practice of such methods as you have seen controlled from the Por Lito that has enabled Turinians to survive. Master science has solved our problem of life, which I know has not yet been presented to your world. Human beings and the Taga are the only survivors. Yet the time shall come when even Sjor, your own world that has such vast seas, will lack water. By that time, of course, life on Turinia will have passed away. I have made careful calculations, which show that existence here may continue for about 500,000 years longer. But the struggle naturally will increase as time goes on.

"The Osinians and the Avinians are separate peoples, or races. Each has a high culture, but it has been centuries since there has been any close contact between them. There is no urge for trade back and forth. Each provides for its own necessities. However, there is a constant watchfulness on the part of each people. Not yet has either fully learned to trust the other. We stay in Osin, all but our flying captains who keep constant vigil along the Avinian frontier. And the Avinians do the same along our border. But there is little contact. The flying captains do not fraternize.

"The Osinians and the Avinians long ago recognized in the Taga, or Bat-men, a common menace. The horde, ages ago, occupied Dir and never ventured beyond their habitat. The high mountains supplied them with water and their subsistence was sufficient to support them in contentment

"But, as the horde increased in population and the struggle for existence became harder, they began to venture beyond the confines of their own region. Both Osinians and Avinians fell prey to their ferocity. The victims were devoured alive. Then both nations co-operated in the gigantic task of building a wall around the craters of Dir to shut the creatures in forever. Destruction of the Taga was considered, our history records, but the idea was abandoned by general acceptance of the moral principle against the taking of animate life save as an extreme measure of protection.

"The Avinians also have built a wall all about their own area, too high for the Taga, who, because of the rarefied atmosphere and the enormous weight of their bodies cannot ascend more than some two hundred feet. Nor do they climb. Having the ability to fly, and little, if any, intelligence, they have never been known to attempt the climbing method of escape from the enclosure. Our flying captains and also those of the Avinians are constantly patrolling Dir under orders to report the first departure from the Taga's natural habits. If, because of necessity, they should feel impelled to escape, and discovered they could climb the wall, the two nations would co-operate together in solving the problem of safety for humanity.

"So the Avinians built their own wall. Osin, however, has depended for her security on the Taga horde staying within its confines.

"War was outlawed on Turinia thousands of years ago. There are no weapons of destruction. If the horde were ever to come, fire would be employed in Osin. But that is something we do not fear. We are confident that the menace has been confined behind those mighty walls of rugged stone."

Conflict!

DR. FRY here made a suggestion.

"But the Avinians have a better form of preparedness than yourselves. They have a double protection, their own wall and that surrounding the horde."

"True, but, since there is no contact between the two peoples there can be no friction or conflict, whereas the Taga are but beasts and will remain where they are. And now, my dear friends, I come to the part of my story that will answer your question.

"I have said that the beautiful Sjorian virgin cannot be yours. The Kor* of Osin has looked forward, as have his ancestors for hundreds of generations, to the fulfilment of a prophecy, and today it is about to come true. It has been a tradition in Osin, or rather on all Turinia, for centuries that a virgin would come from another world to be the bride of a Kor."

Randolph's eyes turned from Horo and sought those of his friend. Fry was visibly affected and was about to speak when Randolph warned him. Horo went on.

"It was the tradition and prophecy that when such a virgin came she would be lovelier than any maid of all Turinia. The Sjorian virgin meets that requirement. Further, it was foretold that, after her coming and mating with the Kor, he would rule all nations on Turinia and that his bride from another world would bring new secrets of power enabling us to prolong life here indefinitely.

* Earth. * Mars.

* King or Emperor.

"So you may readily understand how we were affected when the lovely Sjorian virgin came to us. Everyone recognized that it was the fulfilment of the prophecy. That is why, my dear friend, she has been separated from you who brought her. She is now in the palace of the Kor, carefully guarded against all harm and more highly respected and cherished than was any Koren or queen before her. For, you must understand, the Sjorian virgin is to be a greater Koren than any who preceded her, for, together with the Kor, she shall rule all peoples of Turinia.

"Upon discovering that our beautiful visitor rescued by Ken Jari in a crater of Dir was from Sjor, I reported it to the Kor, and she went at once under heavy escort to the palace."

"So," declared Fry with heat before Randolph could restrain him, "you were responsible for it all!"

"My friend," Horo insisted, "I had no choice. It was my duty. The high priest of Osin cannot be false to his trust. I beg of you to be resigned in this matter. There is nothing that can be done."

Fry laughed bitterly. And bitterly he assailed the Martian's strange philosophy.

"Ah, Horo," he reproached him, "it is indeed hard to find that a man so learned as yourself has faith in a superstition like this. You with your vast knowledge of science catering to a thing of that kind! I tell you that Alicia Rowan could not have been destined for any such fate. She is a normal woman like anyone else, and it is utterly impossible for any prophecy such as you have described to affect her. Nothing was ever more unjust. I shall demand her release by the Kor of Osin."

"My friend—my son!" cried Horo in dismay. "That cannot, must not be! You have the right under our laws to demand an audience with the Kor and his chief adviser, but it will avail nothing in your behalf. I am sure that any maiden in Osin should feel proud to mate with you, but the Sjorian virgin is lost to you forever."

"The devil she is!" retorted the Earth-man, now aroused. "She is going back with me to the Earth, I tell you, and we shall be married. She'll never be Koren of Turinia. I swear it!"

"But, my son, you cannot avert it! It is best that you resign yourself to fate." The old man's tone was kindly, despite his pupil's bitter assault upon him.

"Oh, but I'll find a way!" declared Fry. "I'll get her sooner or later. Make sure of that, Horo."

"I'd help you if I could, I really would," said the aged Martian, his voice trembling with emotion, "for I love you, my friend from Sjor, and I wish your happiness."

A silence fell between them, during which the Earth-man's countenance softened, although the determined look never left his eyes. And before he and Randolph left Horo he put his arms about the old man and embraced him. Horo's love and affection for him had won his own.

CHAPTER XI

Seeking a Way Out

THE next day Fry discovered that Alicia's identity as the Sjorian virgin of the age-old prophecy was known in Osin only to the small group that had questioned her in the Por Lito and a few members of the Kor's own household. Horo gave him this information.

"I advised the Kor against publicly announcing that the prophecy had been fulfilled," he explained. "Ken Jari and Ken Mahu were sworn to secrecy as were the members of my own staff, and the same thing was done in the Kor's palace."

"Why was that?" inquired Fry.

"Because," Horo told him, impressively, "the same prophecy has been treasured for ages by the Avinians. Besides, the Sjorian virgin was found in a crater of Dir, recognized as neutral territory by both nations."

"Oh, I see," said the Earth-man. "The Kor of Avin might also set up a claim to her!"

"Exactly," admitted the master of sciences and high priest of Osin. "So everything has been carefully guarded. The Sjorian virgin was taken secretly to the palace and fitted out with Osinian garments. She has appeared publicly but once, the day you came, and that, we now believe, was an error."

"Just why?"

"Avinian spies are thick in Osin."

"But you say war has been outlawed for thousands of years."

"It has been, but there is intense scientific rivalry between the two peoples, and a thing of this kind would arouse the jealousy and hate of every Avinian. So you see it is better to keep the fact of the arrival of the Sjorian virgin from the people until all arrangements have been made for her mating with the Kor."

The Earth-man paled at this conclusion.

"And what are these arrangements?" he inquired.

"The Kor, under the law, can have but one Koren."

"Well?"

"He already has one."

Fry shook with the strain of his suppressed anger. His hands opened and shut, whitening at the knuckles. It was with the utmost difficulty that he restrained himself. Randolph's presence and the advice he had already given helped him. Randolph was his only friend on Mars except Alicia, and she was as far removed from him as though she had been on another world. And Randolph had warned him repeatedly against giving way to impulses if he hoped to make any progress in solving the problem with which they were confronted.

"And what, Horo," he managed finally to ask in an even voice, although his agitation had not escaped the Martian, "is to be done about it?"

"The present Koren will be divorced."

"That has not yet been done?"

"No, the law is that two *eads*, or, as you say, months, must elapse before this can be put into effect."

The Earth-men looked at each other. Both found relief in Horo's words. This would give them more time than they had expected in which to make plans for Alicia's rescue and their departure from Mars. For they had already planned to make their escape into space the moment they could regain the projectile with her on board.

But Horo, master of sciences and high priest of Osin, was shrewd. He had seen the changed expressions on their faces and the look of encouragement in their eyes. He shook his head.

"Time will not help you, my son," he admonished. "There is nothing you can do. The prophecy must and shall be fulfilled."

Randolph saw his friend stiffen again with resistance, and knew there was forming on his tongue a challenge he would hurl at Horo. He succeeded in warning him with a look, and now was pleased that Fry smiled at what Horo had said.

"But you would not blame me, Horo, my friend," said Fry, persuasively, "if I made the effort, would you? You don't hold it against me if I wish for a way to defeat the Kor's plan?"

Horo seemed to accept this as a form of surrender. The Earth-man for once had been able to deceive him.

"My son," he confessed, "I should never blame you. The Sjorian virgin is worth every effort any man could make to win her. But it was fate that brought you to Turinia, and it is fate likewise that shall take the Sjorian virgin from your arms. I should be glad if it had not happened in this way. I wish your happiness with all my heart, as you know I wish the happiness of all mankind; but I cannot, must not and shall not do or permit anything to be done to prevent fulfilment of this sacred prophecy. The Sjorian virgin must mate with the Kor of Osin and become Koren of all Turinia."

The Earth-men left Horo and went to their quarters in the Por Lito. There they talked long and earnestly of what they had heard, and considered the situation from every angle in an effort to devise a plan of action.

"It is plain enough, Randolph," observed Fry, "that Horo is against us. I cannot move him an inch, although you know I have tried repeatedly. He is devoted to the Kor, as he is to all Osin, and, while I am sure we can count on his love and affection so far as we ourselves are concerned, there is apparently nothing that can make him recognize my right and Alicia's to love and wed as we please."

"Yes," agreed Randolph. "Nothing would move him short of a catastrophe and the proof that we could avert it—if, indeed, that would."

"And here we are helpless. I'd invent a catastrophe of some kind if I could."

"And I, another, if it were necessary," rejoined his friend.

A Plan

THEY were silent for a time, each busy with his own thoughts. Both had recognized the injustice of the order that had denied them access to the projectile. Every want they had expressed had been satisfied, it was true. Ken Jari and Ken Mahu had brought them many articles from the great shell, but always had denied them the privilege of boarding it.

"If only we could steal past the guard and board the projectile," declared Dr. Fry, "we could control the situation, could make a catastrophe as you suggested."

"You mean—"

"That we have the atomic power. Horo hasn't. He told me he had worked the thing out in theory and had discovered its potentialities, but had abandoned it because he feared it might be abused."

"Does he know you have it?"

"No, I have been careful not to betray that."

"But perhaps the Martians have discovered your secret. They have had access to the projectile."

"I know and I have thought of that many times," admitted the scientist. "But Horo has given me his word of honor that not a thing on the projectile should be touched. The flying captains are directly responsible to Horo, and I am convinced of their honesty as I am of his."

"And your idea, Leonard, if you got control of the projectile?" asked his friend.

"I'd simply give them a demonstration of its destructive power and threaten to annihilate all Osin if they refused to surrender Alicia."

Randolph regarded his friend calmly. He knew him well enough to realize he would go to any length to win, but he was secretly glad at the moment that the entrance to the projectile was heavily guarded by loyal Martians.

Henry Randolph was no less courageous than Leonard Fry, but he still believed a way might be found to rescue the girl and upset the plans of the Kor. At any rate he preferred to wait awhile and devote his time to the perfection of some other plan. He did not know that, before a plan of escape could be found, he, too, would be hopelessly in love and willing, nay, eager, to go to any extreme in winning his way to freedom and happiness.

"Just what would you do, Leonard," he asked, "if you had your hands on the projectile's controls at this moment?"

The other was alert on the instant, his expression changing and his eye brightening.

"I'd level one of their public buildings, the Por Lito, for example, after ordering everybody out."

"And then?"

"I'd demand that Alicia be released."

"You think the Kor would surrender her?"

"He would have no choice."

"And if he didn't?"

"I'd level more buildings," declared the scientist.

Randolph smiled. "I hope we shan't be compelled to do that," he said earnestly. "The Martians have built wonderfully. It would be a shame to destroy the Por Lito with its rich treasures."

"I'd do it in a minute for her, Randolph! You don't know what it is to love a woman and have her snatched from you like this."

"Perhaps not, Leonard," Fry agreed, "and I should not try to dissuade you if that were the only way. But I hope it will never be necessary. I'd rather have something else develop and give us our chance."

"But have you any suggestions to make?"

"None now, but I don't think the situation is hopeless."

"We have considerable time, of course," said Fry, who knew Randolph could be depended upon to discover a way out of most predicaments.

"And that is why I am hopeful," insisted Randolph. "It is only lately that we have had a chance to familiarize ourselves with the conditions of life on this planet. We were handicapped before because we could not communicate with anyone. But now, thanks to Horo's methods and our diligence, we can talk their language after a fashion."

"That's an advantage, and in this connection I have a suggestion," returned his friend.

"And that is?"

"That every day we concentrate on our main problem. Let's take advantage of every opportunity to mix with the Osinians. Perhaps we can discover something that may be turned to account."

"By all means," Randolph agreed, "and now that they permit us more freedom it ought to be easy for us to move about and learn what's going on."

Neither suspected in the slightest that, before even another day passed, a condition would develop in which they could see the possibilities of controlling the situation into which they had been plunged against their will.

CHAPTER XII

A Message from Avin

UNTIL now Ken Jari and Ken Mahu had escorted the Earth-men on their travels about the city of Hio. This had been in the forenoon of each day and was for the purpose, as Ken Jari had now confided to them, of preventing a chance meeting with Alicia as she went to the Por Lito for instruction under Horo.

"Today, my friends from Sjor," said Ken Jari, who had come to their quarters alone, "you are free to go about the city as you please. The Sjorian virgin no longer visits the Por Lito. Horo, master of sciences and high priest of Osin, has turned her instruction over to Hanya, chief adviser to the Kor and member of his household. She has done well with her studies. Hanya will be assisted by Tor Floro, the Kor's sister. My orders, direct from Hanya, are that you are now to be permitted to have full freedom of Hio."

Fry was enthusiastic over the prospect, but he found he anticipated too much.

"We may board the projectile then, I suppose?" he inquired.

The Martian flying captain was quick to disillusion him about this.

"No, no. You are not to board the craft under any circumstances. There is a heavy guard at the projectile, and, while I assure you that you will find everything in perfect order just as you left it, I must insist that you make no effort to go aboard. That is," he supplemented, "Hanya insists upon it. In addition, my dear friends from Sjor, Hanya has also declared that you will not be permitted to visit the palace, as you had suggested to Horo, nor make any demands upon the Kor."

"But," Randolph interposed, "we were told we had that right."

The Martian flying captain bowed low, smiling in friendliness. "I am sorry my tall friend from Sjor, but Hanya says no."

"The devil take Hanya!" said Randolph.

"That is the evil one?" guessed Ken Jari.

Randolph nodded.

"Then," said Ken Jari, gravely, "that is very likely to happen."

Fry was visibly disappointed. But he knew it was of no use to argue with Ken Jari, who was only carrying out orders from the palace.

"I have no doubt, however," the flying captain volunteered, "that it will not be long before all restrictions are removed and you will be as free as anyone in Osin."

"After Hanya has no further reason to restrict us, I suppose," commented Randolph.

"Exactly," agreed Ken Jari with readiness. Suddenly he was alert. "Have you ever seen Hanya?" he asked.

The Earth-men shook their heads.

"He has just come to confer with Horo. He is standing now outside. If you will only stand here a moment, you may see him," he suggested.

The Earth-men looked and for the first time saw Hanya, chief adviser to the Kor of Osin. Evidently he was waiting for Horo. He was alone and seemed to be somewhat impatient. A man of force and power was Hanya, one whose countenance suggested he would stop at nothing to achieve his ends. A broad, intelligent forehead, deep-set eyes, a lean face and a straight-line mouth bespoke cunning along with cruelty.

Hanya, the others thought, did not know he was being observed. But in this they erred. He stood at ease, however, for full five minutes while the Earth-men studied him. Then he turned and beheld them, and sauntered toward the apartment, a sardonic smile on his thin straight lips.

"Have the visitors from Sjor enjoyed scrutinizing Hanya?" he asked, disdainfully.

Fry flushed hotly, but Randolph held himself well in hand.

"We have seen more beautiful creatures, I assure you," replied he, "and have therefore known greater pleasure as a result."

It was now Hanya's turn to redden, but his eyes were cold as he looked upon the Earth being who dared to make such a retort.

"But you might have found even Hanya more attractive to the eye under other circumstances, I presume. At the palace, for example, beside the Kor."

"Ah, Hanya," said Randolph with perfect ease of manner, "your presumption is correct, but only in part. I am sure I should enjoy Hanya more if I saw him in a position where he would be obliged to conduct himself with propriety."

Hanya turned livid, and the Earth-men both smiled, enjoying the Kor's chief adviser for the first time, who was none too beautiful in his discomfiture. Yet Hanya, if they had stopped to reflect, had the advantage over them, which he now emphasized with venom. Catching sight of Ken Jari, who stood a little to one side secretly enjoying Hanya's fury, he called out to the flying captain in a tone of authority.

"Ken Jari, the freedom graciously allowed the men from Sjor is to be withdrawn," he ordered.

Important News!

BOTH Fry and Randolph were dismayed, but stubbornly refused to betray it in the presence of the man, who they felt was their one natural enemy on Mars. They said nothing and the expression of their faces did not change.

But Hanya, it seemed, was pleased just as suddenly to countermand this order to the flying captain. It was his nature to turn his enemies to ridicule if possible.

"However, Ken Jari," he said loftily, "that will be entirely unnecessary. Let the original order stand. They are harmless and impotent. It won't matter where they go or what they do."

And, with this parting shot, Hanya, chief adviser to the Kor of Osin, was gone to meet Horo. He did not look back at the Earth-men who still stood where he had left them.

"Leonard, I promise you," said Randolph, "that I'd be happy to do something to that bird!" But he said it never suspecting he would have the chance.

Ken Jari, happy for two reasons, the one being Hanya's rebuke at the hands of the big visitor from Sjor and the other the fact that his friends were to have the freedom he had promised, bowed himself from their presence with a smile. And Fry and Randolph at once began making preparations for their first stroll about Hio without escort.

"This is great, Leonard," declared Randolph. "Now we shall have an opportunity, as we'd say in St. Louis, to study the lay of the land. This is really a godsend to us. We can familiarize ourselves with conditions in Osin. We've got to do that, you know, before we can think of any plans."

They had been provided with native garments, but had not yet worn them. Randolph suggested that they attire themselves as Martians.

"It will give us more freedom because we shan't attract so much attention."

Dr. Fry agreed, and within a short time they emerged from the Por Lito dressed in the attire of Osinian gentlemen. In their soft turban-like hats, close-fitting coats and short breeches with boots of strongly woven fabric, they were sure they would pass anywhere as Martians.

The forenoon passed without incident, but when they paused in their stroll about the city and lingered for a few minutes in one of the small parks, their attention was attracted to two Martians who stood near them. Thanks to Horo and their own diligence, they had picked up enough of the Turinian language to understand practically all of a simple conversation.

One of the Martians was a man somewhat advanced in age and of dignified bearing. He might have been an official. He was talking earnestly to his companion, younger than himself.

"The Avinians," he announced gravely, "have formally demanded that the Sjorian maiden be surrendered to them."

The Earth-men looked quickly at each other and shook their heads in warning. Each had seen on the instant the other's excitement. They strained their ears for more.

"It was as I feared it might be," continued the elder Martian. "Avinian spies discovered her identity, and their Kor, of course, will do everything possible to obtain possession of her."

"The demand has been formally made at the palace?" inquired the younger Martian.

"Yes. Two messengers arrived this morning, Hanya informed me."

"And the Kor?"

"Is greatly disturbed, of course."

"And has the reply been given?"

"At once, and no need to guess what it was. The Avinians messengers have already departed."

The Martians now moved away, ignorant of the fact that the Earth-men had been near them and had heard news that was electric in its effect.

"This," observed Randolph in an undertone, "might develop into such proportions as would help the solution of our problem."

"That is possible," agreed Dr. Fry, "but for the present it may make it more difficult. No doubt the Kor of Osin, urged by Hanya, will redouble his vigilance to prevent Alicia from being carried off to Avin. I am sorry in a way that the Martians don't make war upon each other. For if they did and the two nations fought, we might throw our aid to one or the other and find our opportunity to escape in the meantime. Of course, I shall never leave Mars without her, Randolph, so long as she is alive."

"But the Avinians, even with war outlawed, might make a demonstration, you know," suggested Randoph.

"I understand that, but it is apparent that both the Osinians and the Avinians set great store by the incident of our arrival—or rather that of Alicia—as the fulfilment of an age-old prophecy, and that either nation would go to extremes to prevent the other's possession of her.

"Indeed," Randolph went on, "they might go to war and devise weapons of some kind with which to make a demonstration. From what I have understood, the Avinians have no love for Osin."

"I wonder," said Dr. Fry, "if the coming of the messengers from Avin was responsible for our flying captains' deserting us and for Alicia's studies at the Por Lito being discontinued."

"That seems likely," assented Randolph. "All told, there are twenty flying captains in the service of the Kor. No doubt the whole bunch will be winging along the frontier day and night, now that the Avinians have demanded Alicia's delivery to them. And, in my opinion, they had better keep a sharp lookout. Horo, you remember, has not given the Avinians a good name."

A Message

IT was much more to the point, however, that the two friends learn as much as possible from Martians before they could hope to interpret the meaning of a development, only an inkling of which had come to them as by accident. They started to retrace their steps to the Por Lito, hoping Horo might enlighten them.

On the way Dr. Fry observed a Martian following them. They had chosen a quiet street so that they might discuss more freely the news they had heard. The Martian stayed always the same distance behind them. The scientist said nothing about it to his companion, who, he believed, had not observed the fellow.

A little farther on, as the Earth-men approached the Por Lito and fewer people were to be seen on the street, the Martian advanced till he was abreast of them. His hand touched that of Dr. Fry for an instant, and the scientist felt something thrust between his fingers; then came a whisper from the man, who said in oddly spoken English: "Don't read now. Wait!"

The scientist closed his hand on a folded piece of parchment. A note, he concluded, and no doubt from Alicia, although he had not yet been able to communicate with her. The warning in English was proof enough. She probably had coached her messenger as to just what he was to do and say.

The thing was done so quickly and quietly that not even Randolph had observed it. Fry said nothing meanwhile, but was eager to see the contents of the mysterious message.

Safe in their quarters in the Por Lito, he hurriedly read the note. It was not signed, but it was Alicia's handwriting.

"Come to me tonight. Bring him with you. I shall be waiting, north wing of the palace, on the roof. A guide at the gate nearest the Por Lito will show you the way. Wear native clothing and don't fail. I have important news. Appear at the gate as close to midnight as possible."

Fry followed Randolph, who had gone into another room. First looking about to make sure they were alone, he thrust the parchment into his friend's hand.

"A note from Alicia," he whispered. "Read it."

Randolph read the missive carefully.

"Where did you get it?" he asked quietly, although his friend observed the quickened interest in his eye.

"The Martian who was following us slipped it into my hand as he passed."

"He said nothing, though."

"But he did. He whispered, 'Don't read now. Wait.'"

"I didn't observe that," said Randolph.

"No, he was cautious. No doubt he had been most carefully coached."

"Well, of course, we shall go as she has requested," declared Randolph, "but what do you make of it, Leonard?"

"It's probably this news about the Avinians. What do you think?"

"Yes, I should say so, with the possibility of an additional development of the utmost importance."

"And that?"

"The Avinian demand on the Kor of Osin might serve to speed up the arrangement of which Horo told us."

Dr. Fry was instantly concerned.

"Of course we shall go, and I wish it were midnight now," he declared. "I believe you may be right."

"And I wish we had our automatics from the projectile," complained Randolph. "We may have need of them before the night is over. Alicia possibly has a plan of escape. In that case, her situation is urgent. Meanwhile, Leonard," he cautioned, "let's say nothing at all to Horo about what we heard today."

Two hours later they were with the master of sciences and high priest of Osin in the observatory. The old man plainly was perturbed, yet glad to see them.

"My friends," he said with a note of regret, " I cannot be with you this evening. You are welcome, however, to use the telescope if you like. I am called to the palace."

This suited the Earth-men admirably. It would give them plenty of time to make preparations for their tryst with Alicia.

But Horo had not finished. And now, earnestly regarding them and with a worried look in his eyes, he told them of the message from the Kor of Avin.

"That is why I am going to the palace," he explained. "A serious situation may develop at any time. The welfare of all Osin may be threatened."

"But the Avinians," Dr. Fry reminded him, "have no weapons, as you have said. They could not make war upon you."

Horo shook his fine head.

"They have a wall about their country and we have none," he replied. "And while I have never suspected that they would go so far as to—as to—" The old man did not finish the sentence.

"You were saying—" Dr. Fry began, trying to encourage him to complete what he had begun. But Horo would not.

"I dare not say it, after all, my friends," he told them. "Yet I may say that I have a great fear just the same. The coming of the Sjorian virgin and the desire of the two nations for her make a cause for war greater than any known on Turinia in thousands of years."

"But how could there be war?" demanded Dr. Fry. "Indeed I can't see what the Avinians could possibly do to Osin."

"And that is the very thing of which I dare not speak," declared Horo. "In fact I shall try not to think of it, lest the idea occur to them. But O, it is more horrible than anything that ever befell humanity!" And with that he left them.

CHAPTER XIII

The Tryst on the Roof

DRESSED as Martians, the Earth-men arrived at the gate to the palace grounds a few minutes before midnight. They found the watchman awaiting them. Without a word, but indicating they were to follow him, he went swiftly and silently to a wing of the palace. In the soft light from a high window which fell for an instant on the Martian's face, Dr. Fry recognized him as the man who had delivered Alicia's message.

This was better, he reflected, than for her to have taken too many into her confidence. Discovery no doubt would mean a loss of freedom for all concerned, and probably punishment as well. But the business in hand now was to gain the roof of the palace.

In a darkened corner of the palace wall, which was sheer and smooth, offering no foothold, the Martian stopped. In a moment he found Dr. Fry's hand in the darkness and placed it on a flexible ladder that hung down from the roof.

"Climb, quickly," said the Martian, speaking again in English. Alicia had indeed coached him well.

Fry whispered to Randolph and started upward. Now the Martian told Randolph also to climb. So up went the two adventurers, the Martian following.

The roof gained, their guide led the men to the door of a small, cupola-like room built upon the nearly flat surface. And there the Martian left them as the door

of the small room opened and a slight form emerged.

"Leonard!" It was Alicia's voice. The next moment she was in her lover's arms.

They entered the room, Randolph with them. Then, closing the door gently, the girl touched a switch and the room was flooded with a soft light.

The men fell back, a little startled on discovering a fourth person in the room, a tall, stately and most beautiful young Martian woman. She silently smiled at them and waited.

Alicia surprised them even more by her introduction of her companion.

"This is Tor Floro, the Kor's sister," she said, "as dear and loyal a friend as I have ever known. And we have sent for you because we are both in great need."

The Martian woman smiled as she greeted the Earthmen, but her proud, lovely face betrayed the anxiety she felt. After the fashion of Earth beings, she offered her hand to each of them in turn. Randolph looked long into her luminous eyes as he held her hand, and noted that her color came and her glance fell. Meanwhile he felt a thrill that was entirely new to him. Tor Floro, young and graceful and beautiful, seemed to him to be the loveliest creature he had ever seen.

"I have been terribly worried, Leonard," began Alicia. "I didn't know what had happened to you. I have heard almost nothing about you since the day you landed. Besides, my own predicament has caused me great anxiety. Somehow everybody in Hio thinks I must be married to the Kor of Osin and become Koren of all Turinia. Had you heard that?"

"Yes, Horo told us the whole story," replied Fry.

"Everybody, dear?" reproved Tor Floro, slipping her arm about the girl's waist.

"Forgive me, Tor Floro," begged Alicia. "Everybody but you!"

Once more Alicia turned to Fry.

"Then only today," she went on, "there was a very important development. You know of the existence, I suppose, of the Avinians, another people living beyond the craters of Dir?"

Both men nodded.

"Well, it seems they have this same queer notion about me, and have demanded that Osin surrender me to them to become the bride of their Kor."

"We know that too," said Fry.

"And Tor Floro believes her brother may—may hasten the—the wedding! Oh, Leonard, isn't there *some* way for me to escape it all?"

The girl's distress was acute. But now that she was again with her lover and their dependable and resourceful friend, she felt a measure of relief. Her confidence in them was wonderful.

"We shall try to find a way, dearest," Leonard assured her, "but right now I haven't the slightest idea what it can be."

"Can't we leave here now and board the projectile?" she asked.

"It has been heavily guarded night and day, and we haven't been allowed to approach it."

"Oh," cried Alicia. "Then there may be no way of escape at all!"

(To be concluded)

A Subterranean Adventure

(Continued from page 23)

whispering or murmuring, and each can enjoy the occasion to the fullest.

"But the most important use of the Sonaa in this city of Raa, and in its eleven sister cities, is for the deaf and the dumb, as well as for the blind. Thus, for an instance, a dumb reader by means of a set of Sonaa is able to entertain, through reading, one or any number of deaf-and-blind unfortunates. From this you will understand that when I am now speaking to you, my audible words convey no meaning to your consciousness at all. What really happens is that by means of the Sonaa your mind receives the thought waves of my mind and thus makes direct contact with your consciousness.

"In other words, the Sonaa transforms thought vibration into another form of vibration during the process of transmission, and does the reverse during the course of receiving. The cone on your forehead is the transmitter, and that over your solar plexus the receiver. Moreover the instruments are so adjusted that merely through your individual volition you can render it either selective or general during transmission."

"It is certainly a most wonderful invention," I said enthusiastically. "In our surface world we have something like 2750 different languages and dialects—a fact constituting one of the principal obstacles to international understanding and cooperation. Now, if I have understood you correctly, the Sonaa would immediately eliminate those 2750 international barriers, and our races could enter at once into an epoch of universal cooperation and understanding. I haven't the least doubt that as a result the greatest enemy of mankind, war, would soon be forgotten. It would mean at last universal brotherhood and peace."

"It certainly would," Teddy agreed. "But tell me, Noama, just how is the Sonaa constructed, and by what force does it operate? If we ever get back to our own world we would like to manufacture some, for the good of world peace and progress."

Noama looked at him gravely, and slowly and regretfully shook her head. "That I cannot divulge, Tedde-e. It is a secret of the elect, and we who belong to the elect are bound to secrecy by oath. All I can say is that the motive power of the Sonaa is a synthetic substance which radiates a force of extremely high vibration, and it is this force which does the work."

(To be continued)

The Incredible Monstrosity

(*Continued from page 37*)

weak or so defenseless as the invaders had imagined; or else they themselves, trusting to events which had never transpired, and placing faith in men who were among the missing at the critical moment, had been entirely too confident of their own ability.

With radio communication from the fleet coming in fragmentary messages, the pilots waiting to bomb the cities to the north and south hesitated—too long for their own safety. Anti-aircraft guns were established at strategic points along the borders. Those planes and pilots that managed to return from the hard-fought battle with the fleet were more than enough to defend against an attack by air.

And across the continent, now from west to east, to the accompaniment of its ceaseless "Scarab—Scarab—Scarab" rushed a blood-stained engine of destruction, no longer an agent of commerce but a weapon of warfare upon which centered the hopes of a nation. Pilots thinking to bomb the great target could not reckon with its speed; when their cordite struck, it tore up parts of the runway, but the Scarab flew on, apparently unharmed, like a messenger of destiny.

Of course, the war, or what might have been a war, was not over in a day. It is not the intention of this chronicle to recount the final steps in the conclusion of hostilities, or to dwell upon the destruction of the only remaining menace—the invading planes. A new America emerged from the conflict. Every schoolboy knows to-day how friendly are our relations with the Orient; how greatly we are respected by the rest of the world.

And the Scarab Transportation Company, started first as a selfish commercial venture, has come down in history as one of the chief causes for the sudden cessation of hostilities. Today there is scarab transportation in every important nation of the world; and those who are carrying on the work of Verne are at this moment cutting a level runway across the vast level plains of Russia.

Undoubtedly the greatest engineering feat of all time, the construction of the first scarab runway still remains as a marvel. But, as Verne remarked to Hardy, after the return of the Scarab: "It's funny! The whole country was waiting to see her run through on her first trip, and she went at night with not a soul to send her off but a wounded man. And the first reception committee wasn't so pleased to see her at that! Wonder how *you'd* feel with a quarter of a mile of murder dropping on you from the clouds!"

THE END.

ANNOUNCEMENT

WE are pleased to announce that, beginning with this issue, SCIENCE WONDER STORIES has been combined with its sister magazine, AIR WONDER STORIES, and the newer and bigger magazine will be known as WONDER STORIES.

As our readers no doubt know, AIR WONDER STORIES has been the science fiction magazine of the air, and has continuously devoted itself, not only to air science fiction, but to interplanetary stories as well.

In all future issue of WONDER STORIES, we will have one or more aviation science fiction stories of the same high standard which were always published in AIR WONDER STORIES.

All the other features of AIR WONDER STORIES will be preserved in this new magazine. The addition of occasional air science fiction stories will of course enhance the high standing of WONDER STORIES, and give to the readers of both former magazines a greater variety of fine reading.

PUBLISHERS.

Science Questions and Answers

THIS department is conducted for the benefit of readers who have pertinent queries on modern scientific discoveries and on established scientific facts. As space is limited we cannot undertake to answer more than three questions for each letter. The flood of correspondence received makes it impractical, also to print answers as soon as we receive questions. However, questions of general interest will receive careful attention. If you desire individual answers to your queries, enclose 25c in postage to cover time and mailing.

What is a Robot?

Editor, Science Questions and Answers:

Please give me the correct pronunciation, origin, and definition of the word ROBOT. I know what it means, but I do not know why a mechanical man, or a mechanical apparatus resembling a man, should be called a ROBOT.

P. H. Beaulieu,
Red Lake, Minnesota.

(The term ROBOT was first used years ago in a play by the Bohemian dramatist Karel Capek, called "R. U. R." This play dealt with the labor problem—it was sociological in its theme—and it featured a race of artificial men known as "Robots" who worked at the command of a directing mind. Its origin was from the Czech, the word "robot" meaning a worker. Thus the term passed into the language, and came to refer to any mechanical device which could apparently act like a human being. It refers, for example, to the new dial telephone exchanges, for the machines can get a number with more accuracy than a human operator.

The word, as far as we know, is pronounced with the accent on the first syllable. The first "o" is long, as in "over;" the second "o" is short as in "but."—Editor.)

The Circumference of Space

Editor, Science Questions and Answers:

1. Will you publish the circumference of space? Also the relative distance of the earth from the edge of space?

2. At what speed does the earth travel around the sun, and at what speed does the solar system travel around what point?

3. What is the exact speed of light? Would light striking the edge of space continue on its way, or would it reflect?

Robert Stanton,
Detroit, Michigan.

(1. Since no one has as yet been able to compute the extent of space, we cannot say anything about its circumference. Indeed, we do not know what its shape is—if it has any shape—and so to regard it as a sphere would, while natural, be a mere supposition. Einstein believes space to be almost infinite in extent; but as far as measurement is concerned, the generally-accepted diameter is about 500,000,000 light-years. A light-year is approximately 6,000,000,000,000 miles.

The relative distance of the earth from the edge of space, as will be seen by the answer to the previous question, cannot be computed; but it is thought that our own individual universe is somewhere near the center of the "cosmos"—the aggregate of all the universes, most of which are greater than our own. An idea of the smallness of our solar system may be obtained when it is learned that the star Betelgeuse is more than 200,000,000 miles in diameter, whereas our own sun is somewhat less than one million miles. If the solar system could be placed in Betelgeuse, with the sun in the center, the great star would enclose the entire system almost as far as the orbit of Mars. And there are stars larger than this giant sun; so our own system is insignificant in the scheme of things.

2. The earth makes one complete revolution around the sun every year, traveling at the rate of nearly 68,000 miles per hour. The solar system, which is traveling at 12 miles per second toward the general direction of the star Vega, moves with its Galaxy in a greater galaxy around the star cluster in Sagittarius, as explained more fully in the March issue.

3. The speed of light is 186,000 miles per second. According to Einstein, space is finite; although light can never come to its end, but would keep going on and on. There is no "edge of space," as can be seen by the paragraph about the shape of the cosmos. The theoretical belief is that light would travel on, following the shape of the limits of the cosmos, until it returned approximately to its source.—Editor.)

The Atom of Gold

Editor, Science Questions and Answers:

Please explain the structure of the atom. I read a story that said an atom of gold had an atomic number of 79, and had 79 protons and 79 electrons to balance the protons.

Edgar Hurd,
Box 32,
Weott, California.

Illustrating the general construction of an atom of gold. A is the nucleus having a surplus of 79 protons over electrons. K, L, M, N, O, etc., represent the orbits of 79 full electrons whose negative charges balance the positive charge of the nucleus.

(The atom is like the solar system. It consists of a nucleus, which contains the protons—which are positively-charged units of matter—and "bound" electrons; and the "free" electrons which are negatively-charged units of matter and which revolve around the nucleus at a tremendous speed. The story you read was correct in that it gave gold an atomic number of 79, which theoretically represents the excess of positive charges over the negative charges in the atomic nucleus. In other words, there are 79 more protons in the nucleus of the gold atom than there are "bound" electrons in the nucleus. This excess of positive charges is made up for by 79 electrons, containing negative charges which rotate around the positive nucleus. Therefore, the story was not altogether correct in giving gold 79 protons and 79 electrons to balance them.—Editor.)

Are the Winters Getting Warmer?

Editor, Science Questions and Answers:

It has been noted that winters are becoming less cold and more warm. How do you account for this change in climate?

William H. Becker,
1637 York Avenue,
New York, N. Y.

(So far as we know, there is no general change in the temperature of the winter in the United States. No scientists have made such sweeping assertions. Of course, there are variations in temperature. No two winters are alike. Storms which bring snow and sleet may strike certain parts of the country; or they may be blown elsewhere. But in general there has been no distinct meteorological change which would warrant the assertion that the winters are getting warmer.

There is a theory, however, that the effects of the last Ice Age, or the Glacial Age, the remains of which are still visible near the poles, and in mountain regions, are gradually receding. This may, in hundreds of thousands of years, make the winters more nearly as warm as the other seasons are now; but the effect cannot be observed in this generation, nor for many generations to come.

As a matter of fact, the winters during the past decade seem to have been getting colder. From the "World Almanac" for 1930 we may take the average temperatures in New York City of the months of January since 1871. From 1871 to 1879, the weather bureau's observations for January averaged 28.6 degrees F.; 1880—1889, 30.04, 1890—1899, 31.32; 1900—1909, 31.79; 1910—1919, 32.18; 1920—1928, 27.51. Up to 1920, the Januaries seem to have been getting warmer; but during the last decade there has been a decided drop in their mean temperature.—Editor.)

IN this department we shall publish every month your opinions. After all, this is your magazine and it is edited for you. If we fall down on the choice of our stories, or if the editorial board slips up occasionally, it is up to you to voice your opinion. It makes no difference whether your letter is complimentary, critical, or whether it contains a good old-fashioned brick bat. All are equally welcome. All of your letters, as much as space will allow, will be published here for the benefit of all. Due to the large influx of mail, no communications to this department are answered individually unless 25c in stamps to cover time and postage is remitted.

Scienceers Favor New Title

Editor, WONDER STORIES:

Your decision, announced in the May issue, to omit the word "Science" from the title of this magazine has my hearty approbation. I have discussed the change of name with more than twenty other readers—members of The Scienceers—and without one exception, they favored the new appellation.

For the benefit of those who may oppose the change, I would point out that the present title is less cumbersome and more euphonious than the old one. It is also truly descriptive of the magazine's contents, which are indeed *wonders* of the imagination. Above all, the change in name will undoubtedly gain new readers for the magazine, and that should be a source of gratification to us all.

Congratulations on WONDER STORIES' first anniversary and best wishes for its future success!

Allan Glasser, 981 Forest Avenue,
New York, N. Y.

(We are glad to get this comment from Mr. Glasser. The *Scienceers* is a group of young men who have made as their object the study of science from the point of view of the laymen. We can assure them as we have assured others that the change in title implies no change whatever in the contents—except as we have continually said to make it better and better. We are grateful for this expression of approval. —*Editor.*)

Pearls Before the Swine!

Editor, WONDER STORIES:

Your announcement of the change of the name of "our" magazine comes to me as a rather unpleasant surprise. I fail to see the logic behind such a step, which seems to me to be retrogressive rather than progressive.

Your aim, I take it, is to make the title more "catchy" to that class of magazine addicts who are already reading "Sappy Stories," "Slushy Romances," and so on, ad nauseam. I believe this is a mistake.

Consider the reaction of the really discriminating reader, unacquainted with SCIENCE WONDER STORIES, when he sees the title, "WONDER STORIES. Mystery, Adventure, Romance." He will pass it up without a second glance. Such a title is hiding your light under a bushel. It will cost you readers who would really appreciate the stories you publish, because the new title will scare them away from buying their first copy. It will attract a type of reader to whom S. A. means sex appeal and not scientific adventure. He will buy one copy, and because he lacks sufficient cerebration to grasp the science in the stories, he will go back to his "Sloppy Stories" next time he visits the newsstand. Why cast your pearls before the swine?

In my own case, I missed a lot of science fction which I am sure I would have enjoyed because the magazine of which you were formerly editor scared me away with its lurid title. If the word Science had been prominent on its covers I would have bought the first copy I ever saw. The correction of that fault is one of the things that sets SCIENCE WONDER STORIES immediately above your former magazine.

"First impression" is the key to sales volume. The public is becoming sold on science (and pseudo-science) by the thousands daily, and the word no longer frightens the majority away.

In short, you are making a bid for a lot of unappreciative transient customers at the risk of losing potentially permanent subscribers and boosters. I predict that any increase in newsstand sale following this change will be only temporary and will then drop to sub-normal.

Yours for SCIENCE WONDER STORIES,

Lloyd E. Foltz, 40 S. Bellevieu Place,
Indianapolis, Ind.

(We believe Mr. Foltz is under a misapprehension as to the change implied in the change of title. He puts readers into two classes—those who are genuinely scientific and therefore intelligent and appreciative; and those who are unscientific and therefore moronic.

He overlooks the point that between these two is a great body of intelligent, appreciative readers of magazines who would read our stories if *they knew what they were about.* From all the evidence we could procure, these possible, desirable readers, in the confusion of the modern newsstand, obtained the impression that our magazine was a highly scientific periodical, not a fiction magazine. Now this body of readers that we have in mind are not scientifically educated. They may be lawyers, teachers, other non-scientific professional men and women, etc. and though they are interested in the progress of our world, the wonders of modern and future life, the possibilities of interplanetary travel etc. they have not the background or inclination to read heavy scientific articles such as they imagine our magazine to contain.

As for the readers who prefer magazines such as Mr. Foltz mentions, inasmuch as they like water will tend to find their own level, there is no harm done. But we are sure that our present body of readers will be benefitted from the addition to their ranks of thousands of intelligent, imaginative but non-scientific men and women. However, we are grateful for Mr. Foltz' remarks—*Editor.*)

ON LETTERS

BECAUSE of the large number of letters we receive, we find it physically impossible to print them all in full. May we request our correspondents, therefore, to make their letters as brief and to the point as they can; as this will aid in their selection for publication? Whenever possible, we will print the letter in full; but in some cases, when lack of space prohibits publishing the complete letter, we will give a résumé of it in a single paragraph.

Interplanetary Society Now Formed

Editor, WONDER STORIES

I wish to inform you of the formation of the first organization in America whose sole purpose is the promotion of Interplanetary travel—I refer to the *American Interplanetary Society.* Quoting its constitution, the objects are: "the promotion and interest in and experimentation toward interplanetary expeditions and travel; the mutual enlightenment of its members bearing on the astronomical, physical and other problems pertinent to man's ultimate conquest of space; the stimulation, by expenditure of funds and otherwise, of American scientists toward a solution of the problems which at present bar the way toward travel among the planets; the collection, correlation and dissemination of facts, information, articles, books, pamphlets and other literature bearing on interplanetary travel and subjects relating thereto; the establishment of a library containing such literature for the information of members, scientists and others to whom the privilege may be granted by the society; the raising of funds for research, experimentation, and such other activities as the Society may from time to time deem necessary or valuable in connection with the general aim of hastening the day when interplanetary travel shall become a reality."

The society has been organized by a group of mature, scientifically-trained men who believe that through forming a strong national society for the encouragement of interplanetary experiments, etc., a great public interest can be aroused in the matter, and the day when the first flight is made may be brought closer by perhaps many years.

The headquarters are located in New York City; and the society is desirous of adding to its active membership mature, imaginative, interested men and women who believe wholeheartedly in the possibility of interplanetary travel and are willing to participate in the necessary activities to promote the aims of the society.

The officers are David Lasser, 901 Walton Avenue, New York City, President; G. E. Pendray, 450 West 22nd Street, New York, Vice-President; C. P. Mason, 302 West 22nd Street, Secretary, Laurence Manning, 50 Church Street, New York, Treasurer; and Fletcher Pratt, 182 West 4th Street, New York, Librarian. Further information may be obtained by writing to the secretary.

C. P. Mason, Secretary,
American Interplanetary Society,
302 West 22nd Street,
New York, N. Y.

(We cannot speak too highly of the efforts of this society to popularize and promote the idea of interplanetary traveling. There is no doubt but that the United States at present lags far behind the European nations in its interest and activity. This is chiefly due to the skeptical belief of the American public, and its newspapers, that interplanetary traveling is another wild chimera of someone's disordered imagination. We wish to extend to this society our enthusiastic support.—*Editor.*)

Not So Far in the Background

Editor, WONDER STORIES

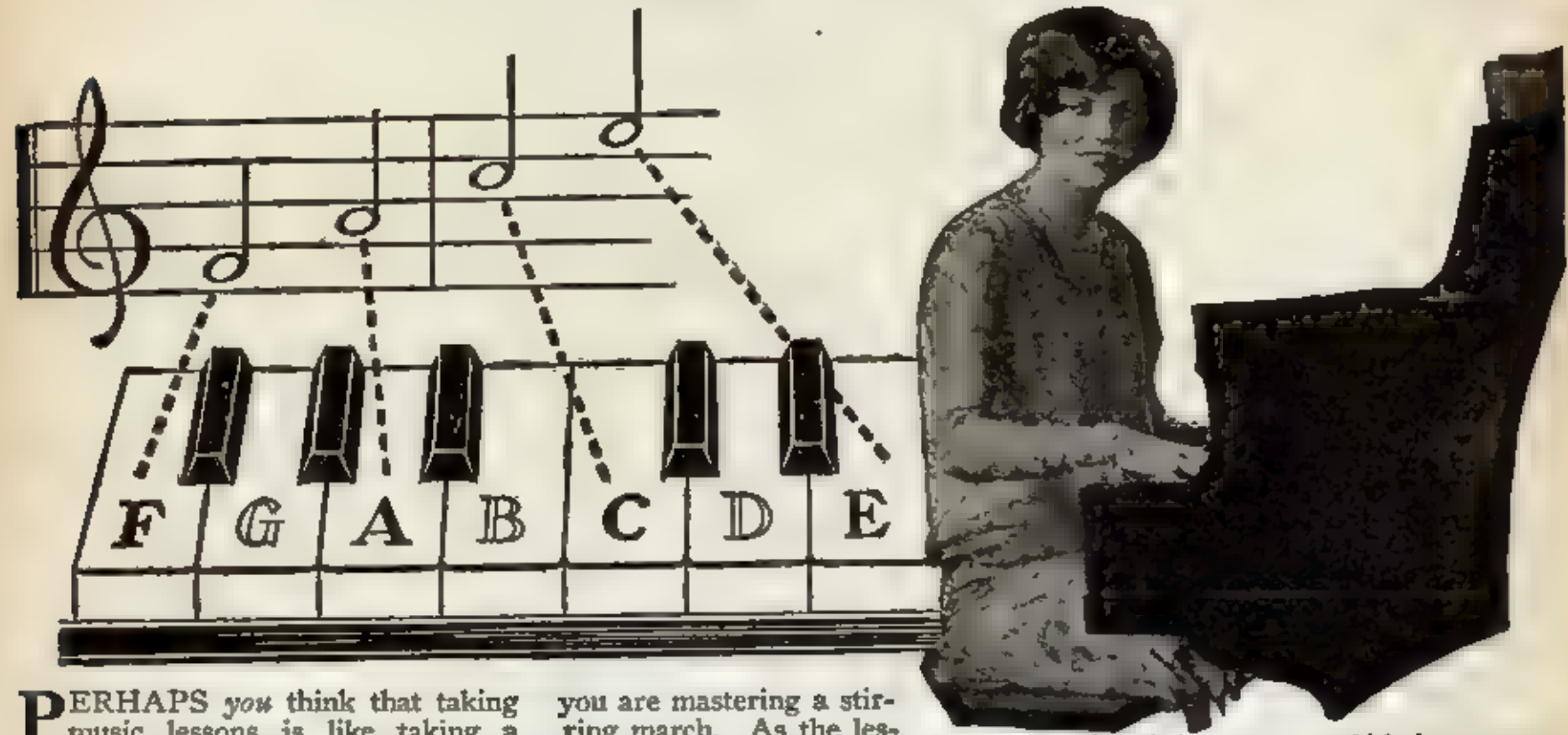
After perusing and passing judgment on the April and May issues of SCIENCE WONDER STORIES, I feel that there are several things which I would like to comment upon.

First of all, a bouquet. The "Evening Star" is, in my judgment, the best story printed in "our" magazine this year. This marvelous sequel to "The Conquerors" is a masterpiece which may be favorably compared to any recent story in the annals of science fiction. Although a few months ago I could not have believed it, Dr. Keller is becoming better and better. He is, without doubt, the most outstanding writer of science fiction of to-day. And another thing, Francis Flagg more than redeemed himself with "An Adventure in Time," which was immeasurably better than "The Land of the Bipos." "Gulf Stream Gold," "The Infinite Brain" and "The City of the Living Dead" were all fine; taken all together the May issue was much better than either the March or April copy. Your editorial in the April copy was very interesting and up to the usual standard.

Now a little criticism. I have noticed lately on the top of our magazine the glaring streamer

(*Continued on page 80*)

To those who think Learning Music is hard-



PERHAPS *you* think that taking music lessons is like taking a dose of medicine. It isn't any longer!

As far as you're concerned, the old days of long practice hours with their horrid scales, hard-work exercises, and expensive personal teacher fees are over and done with.

You have no excuses—no alibis whatsoever for not making your start toward musical good times *now!*

For, through a method that removes the boredom and extravagance from music lessons, you can now learn to play your favorite instrument entirely at home—without a private teacher—in half the usual time—at a fraction of the usual cost.

Just imagine . . . a method that has made the reading and playing of music so downright simple that you don't have to know one note from another to begin.

Do you wonder that this remarkable way of learning music has already been vouched for by over a half million people in all parts of the world.

Easy As Can Be!

The lessons come to you by mail from the famous U. S. School of Music. They consist of complete printed instructions, diagrams, and all the music you need. You study with a smile. One week you are learning a dreamy waltz—the next you are mastering a stirring march. As the lessons continue they prove easier and easier. For instead of just scale you are always learning to play by *actual notes* the classic favorites and the latest syncopation that formerly you only *listened* to.

And you're never in hot water. First, you are *told* how a thing is done. Then a picture *shows* you how, then you do it yourself and *hear* it. No private teacher could make it clearer or easier.

Soon when your friends say "please play something" you can surprise and entertain them with pleasing melodies on your favorite instrument. You'll find yourself in the spotlight—popular everywhere. Life at last will have its silver lining and lonely hours will vanish as you play the "blues" away.

New Friends—Better Times

If you're tired of doing the heavy looking-on at parties—if always listening to others play has almost spoiled the pleasure of music for you—if you've been envious because they could entertain their friends and family — if learning music has always been one of those never-to-come-true dreams, let the time-proven and tested home-study method of the U. S. School of Music come to your rescue.

Don't be afraid to begin your lessons at once. Over half a million people learned to play this modern way—and found it easy as A-B-C. Forget that old-fashioned idea that you need special "talen." Just read the list of instruments in the panel, decide which one you want to play, and the U. S. School will do the rest. And bear in mind no matter which instrument you choose, the cost in each case will average the same—just a few cents a day. No matter whether you are a mere beginner or already a good performer, you will be interested in learning about this new and wonderful method.

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Trombone	Harp
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READ 'EM AND LAUGH. The pet story of each of a hundred world-famous celebrities personally interviewed by the author. Each person is introduced by a topical introduction followed by an uproarious caricature by the author.

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Please send me the book (or books) selected below. I have encircled the numbers I desire. I enclose remittance for $ . . . at the rate of 35¢ a copy or 3 books for $1.00. You are to send the books to me postpaid (CANADA and FOREIGN 5¢ extra postage per book)

I have selected the following books 1 2 3 4 5 6

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THE READER SPEAKS

(Continued from page 79)

"MYSTERY-ADVENTURE-ROMANCE" and the word, science, in faint yellow letters on a white background as if attempting to hide the real purpose of the magazine. Now we have been served notice that the word, science, will be dropped entirely. Since the primary purpose of this magazine is the advancement of science, I wish the scientific background would not be kept quite so far in the *background;* there are tons of adventure magazines on the market. However, if the type of stories is to remain the same, I will overlook the cover and continue reading the magazine as of old.

Wayne D. Bray,
Campbell, Missouri.

(In conformity to our policy of open mindedness we are printing letters which show all varities of opinion on the change of title. Mr. Bray's is very interesting; he comments on the fact that there is a change of title and yet he notes that the May issue was the best yet. He brings out what we have tried to; that the change of name has absolutely nothing to do with the contents of the stories—and the only change is one for the better—*Editor.*)

Why Not the More Distant Planets?

Editor, WONDER STORIES.

My reason for writing this letter is to congratulate you upon that story of stories—"The Flying Legion" which ran in the January—April issues of AIR WONDER STORIES. It was one of the best and most interesting stories I have read.

Why not stop printing stories that deal with "planet masters" and the yellow peril foolishness. Give us more stories of interplanetarian travel, but have your authors write about the more distant planets. Why pick on the Moon, Mars and Venus?

As for your magazines, (and the new WONDER STORIES, I hope) the paper is good, the stories fine, the drawings excellent. I am pleased.

Melvin F. Evans,
144 Clark Avenue,
Chelsea, Mass.

IF you have not as yet seen the SPRING SCIENCE WONDER QUARTERLY

WATCH FOR THE GOLD COVER

Be sure to procure a copy immediately from your newsstand.

NOW ON SALE!

This magazine specializes in interplanetarian science fiction and the Spring issue contains the following marvelous stories:

"The Stone from the Moon"
By Otto Willi Gail
"The Ape Cycle"
By Clare Winger Harris
"Via the Hewitt Ray"
By M. F. Rupert
"The Thought Materializer"
By F. R. Long
"Within the Planet"
By Wesley Arnold
"The Mad Destroyer"
By Fletcher Pratt

Thinks Title Change Beneficial

Editor, WONDER STORIES:

Do I like David H. Keller? And how! I think that "The Conquerors" and its sequel "The Evening Star" are the two best serials you have yet published in WONDER STORIES. Another good story in the May issue was "The Infinite Brain," by John S. Campbell. I read this story straight through without interruption.

I think that the change in title will increase the circulation of "our magazine." The headline: "Mystery—Adventure—Romance" will also help to attract new readers.

I am glad to se that you have cut down the non-fiction, you now have just the right amount. I hope that you cut out "Science News of the Month" when you put out your new magazine.

(Continued on page 83)

BRAND NEW CORONA GENUINE *Model* *3

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F. J. Barsuglia, Jr. writes: "I am very well pleased with your little Corona and I must say I do not know what I would really do without it. It works like a charm and has every convenience of a larger machine."

Mrs. G. Bernstein says: "Allow me to thank you for prompt delivery of the Corona. I am delighted with it and know I shall derive great pleasure from its possession."

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Only a limited number of these splendid machines available. To get one, you must act now! Experience the joy this personal writing portable typewriter can give you! Use it ten days free! See how easy it is to run and the splendidly typed letters it turns out. Ideal for the office, desk, home, traveling. Small, compact, light, convenient. Don't send out letters, manuscripts, reports, bills in poor handwriting when you can have this Corona at such a low price on such easy terms. Remember, these are *brand new* machines right out of the Corona factory.

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Ship me the Corona, F. O. B. Chicago. On arrival I'll deposit $2 with express agent. If I keep machine I'll send you $3 a month until the $37.90 balance of $39.90 price is paid, the title to remain with you until then. I am to have 10 days to try the typewriter. If I decide not to keep it, I will repack and return to express agent who will return my $2. You are to give your standard guarantee.

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Have you ever seen a Grampite —or a hahoe? Have you ever imagined the fearful, wonderful adventures that might lie before the bold man who sought to conquer an Amazon queen on the planet Venus? You'll find a weird, new world of strange sights and thrills as your imagination soars to astonishing heights in this tale of life millions of miles away.

THE PLANET OF PERIL

By Otis Adelbert Kline

Suddenly transported by psychic wizardry to the beautiful and mysterious neighbor planet, Venus, Robert Grandon, who all his life had craved adventure, found it a'plenty.

Grandon was a fighter, and fighting ability was the price of life on Venus. His adventures with savage men, ferocious beasts, gigantic reptiles, enormous, blood-sucking bats and other horrible animals, follow in such quick succession that the interest in the story is at white heat all the time.

Then there is Vernia. Vernia, queenly, beautiful, and tyrannical, who led an army against Grandon. She won and she lost, but the losing brought her the greater joy.

For that vast army of men and women who love a tale that stirs the imagination, a tale of amazing adventure, of fearful and wonderful happenings, a tale the like of which has never been told before, this book has been written.

At positively no increase in price, the readers of WONDER STORIES may secure a genuine, first edition copy of "The Planet of Peril," autographed by its celebrated author, Otis Adelbert Kline. As this edition is very limited, we advise you to send in your money at once.

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THE PLANET OF PERIL

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City and State.....

It's a story with "a real kick."

THE READER SPEAKS

(*Continued from page 80*)

The thinner paper you use the better I'll like it as long as it's not tissue paper.

Jack Darrow,
4225 N. Spaulding Ave.
Chicago, Ill.

(We are glad to note this comment on our change of title and incidentally on the combination of AIR and SCIENCE WONDER STORIES to form the newer and bigger WONDER STORIES. We are sure that this change will give the readers of both former magazines a greater selection of stories, and the stories themselves will become better and better. As we have said before, we contemplate no change in our general editorial policy except, as always, to continue to improve the quality of the magazine.—*Editor.*)

Praise and Condemnation

Editor, WONDER STORIES:

Have just completed reading "The Flying Legion" and cannot resist the impulse of expressing my appreciation of this gem of literature.

George Allen England is by far your best author and I hope he "finishes" his tale—for it is not really finished with such an ending. The end is not exactly poor, but there is material for another good story. In other words, I believe, he has merely taken a breathing spell. Am I right?

Amazing Detective Tales

Combined with the Wonders of Science, this new magazine offers you Mystery, Intrigue, Romance, and swift Adventure.

A super-size book published every month, containing the best stories by the best authors in this field.

S. S. Van Dine, Edwin Balmer, William B. MacHarg, Henry Leverage, Edmond Hamilton, Dr. Austin Freeman, Dr. David H. Keller, all combine to make your imagination soar into the thrilling heights of scientific detective fiction. And the Editorial Commissioner is Arthur B. Reeve, the founder of the super-scientific detective.

Here is just a glimpse of the June issue—now on sale at all newsstands:

THE SEALED ROOM, by Henry Leverage. A dead man in a closed room. Who is the murderer and how was he murdered?

THE DIAMOND MAKER, by Arthur B. Reeve. This famous author at his best.

A MATTER OF MIND READING, by Edwin Balmer and William B. MacHarg. How psychology reads into our innermost hearts.

THE BLUE SPANGLE, by Dr. Austin Freeman. Thorndyke, the famous detective, works against circumstantial evidence.

And many other astonishing mysteries.

LOOK FOR IT ON MAY 15TH.

I believe I am expressing the views of many of the readers of your publication when I state that England has set a standard in your particular field of literature. Many of your stories are too extreme or fantastic for good reading. England a couple of times over played with facts in describing a city carved from solid gold. In spite of these discrepancies he makes his story almost a masterpiece with his narration of Oriental life and natural human reactions. His descriptive work could well be copied by other authors in this field. Your usual run of stories seem to consist of a vague description of an invention without considering that they all usually start and end much the same. It would

(*Continued on page 84*)

PATENTS

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At the left is a view of my drafting and specification offices where a large staff of experienced experts is in constant employ. All drawings and specifications are prepared in my offices.

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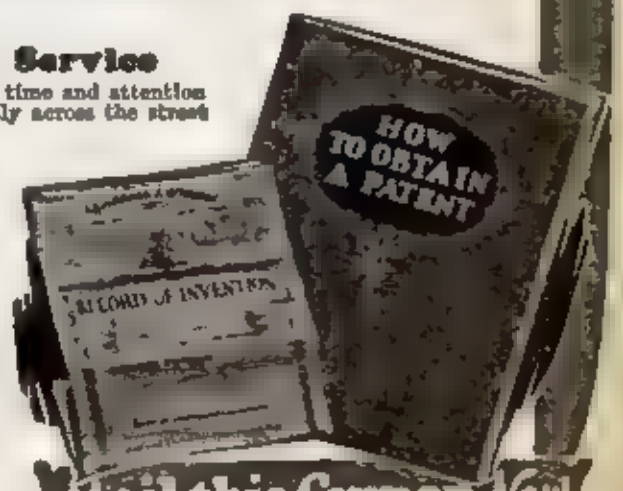

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Two Traveling Men Conversing . .

1st: "What's it costing you a week now, Bill?"
2nd: "About $60.00."
1st: "60.00! How do you do it? Mine run $75."
2nd: "I stop at . . .
MADDUX HOTELS."

YOU CAN safely follow the lead of the traveling man. His home is a hotel most of the year. He looks at a hotel with the same exacting eye with which he views his own home. He expects and rightfully demands comfort and luxury without extravagance. That is just what he gets at a Maddux Hotel—and that is the reason that the representatives of leading concerns are more and more making Maddux Hotels their headquarters. Maddux Management assures them and *you* of the utmost in Comfort, Service and Modern Convenience—plus worth-while economy in dollars and cents.

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TO NEW READERS If this is the first issue of WONDER STORIES that you have read, surely you will want to read many of the back issues. Any issue since June 1929, may be had at twenty-five cents the copy. Send cash, check or money order to WONDER STORIES, 98 Park Place, New York City.

THE READER SPEAKS

(*Continued from page 83*)

high level of literature it should adhere more to facts or at least have the authors follow the narration standard set by England in "The Flying Legion."

I have one more kick to make and I will sign off. I believe I express the views of your readers when I condemn all continued stories. If you don't believe this, ask them. I realize, of course, if you can trick any one into starting one—and if it *is* a good one— it is only natural that the reader would buy till the end. From your viewpoint of money making it is good business, but there is positively no sense to the proposition of forcing your readers to carry their interest from one long month to another. Your defense of course is they are too long for one issue. Right here I state, "The Flying Legion" could have been published in full length in one issue. Many of your short stories contain the basic foundations for wonderful long stories and many are but space fillers because they are too abrupt and incomplete.

I trust you have not been offended by the tone of this letter and take it in the way it is intended—one of friendly criticism from a regular reader. I will continue to read on and on with the expectation your publication will fully come up to my ideal of what your literature should be.

W. R. Spangle,
Elkhart, Ind.

(The serial question seems destined to be a serial itself, for it is never-ending.

Although Mr. Spangle was very enthusiastic over "The Flying Legion" and would have wished that it be published in one issue [even that could not have been done] to the exclusion of every other story, another reader would have preferred another story such as, for instance, an interplanetarian. The reason for serials is that they permit good long stories to be published as well as a number of shorter ones.—*Editor.*)

Wants More About Brunton

Editor, WONDER STORIES:

I have just finished the May issue of SCIENCE WONDER STORIES and was very much surprised at the ending of the Conquerors on the planet Venus. On the whole I was very much impressed by this story and I wish Dr. Keller would write more stories about Sir Harry Brunton and Percy Whitland on the planet Venus.

How about further adventures of David Cantrell and the *Barracuda* by Ed Earl Repp?

I have also read your AIR WONDER STORIES, SCIENTIFIC DETECTIVE MONTHLY and SCIENCE WONDER QUARTERLY and will of course continue with the new WONDER STORIES. The idea looks good.

Herbert Fortune,
Lewiston, N Y

(We understand that Dr. Keller's fertile mind is already at work on some new big stories for us. We hope we can make some announcement in the not too distant future. From the avalanche of letters we received about his stories, we doubt whether he can write them as quickly as our readers devour them.

We are pleased to get this correspondent's comments on our old and new magazines. Bigger and better stories are in view for the new WONDER STORIES and the others.—*Editor.*)

Favors "Mystery-Adventure-Romance"

Editor WONDER STORIES.

I have just finished reading the May issue of "our" magazine, and I can truly say it is the best 'mag' I have ever read.

In the department, "The Reader Speaks," Mr. Bray criticizes "The Land of the Bipos." I think although it was a short story, it was quite interesting and enjoyable. Couldn't we have a sequel to it?

Also on the cover you have, "Mystery, Adventure, Romance." I think this is a very good idea, many people seeing the old title, SCIENCE WONDER STORIES, classified it as scientific bunk, but now you enlighten people as to its contents.

In this month's issue, I enjoyed, "Gulf Stream Gold" best, "The Infinite Brain" second, "The Horrible Transformation" third, "The City of the Living Dead" and "Evening Star" fourth, and "The Day of the Beast" fifth. My favorite author is Dr. David H. Keller. Also Ed Earl Repp, John Campbell, Harl Vincent, and last

(*Continued on page 86*)

Chemistry Offers You

A Fortune

If You Want a Job with a Future, Get into Chemistry

T. O'Conor Sloane, A.B., A.M., Ph.D., LL.D.

Chemistry is one of the most ancient and honorable callings known to man. During the Middle Ages its adepts were the advisors of kings. Then it was called a black art and its followers were believed to have supernatural powers.

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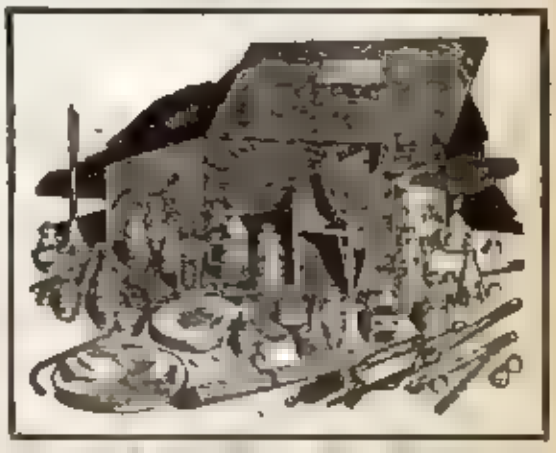

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TURN TO PAGE 95 and read the special announcement of the new scientific-technical-mechanical magazine which is now published.

THE READER SPEAKS

(*Continued from page 84*)

but not least Francis Flagg.

Of all the stories printed so far the best ones are the "Radium Pool" and "The Conquerors."

Miss Elizabeth Toth,
3193 E. 134th St.,
Cleveland, Ohio.

(Miss Toth evidently knows her science fiction, for she is able to pick out unerringly the best that there is. Her letter like so many others was appreciative of the fact that while we still maintain the same high quality of our stories, we are making a wider appeal; gathering new converts to science fiction so that in the end the readers will get more and better stories. —*Editor.*)

Scientific Mystery

Editor, WONDER STORIES:

I am writing this letter for three reasons.

First, if you are going to leave out the "Science" in SCIENCE WONDER STORIES put at the top of the page—"*Scientific Mystery—Adventure—Romance.*" I don't see how "Science" retards the progress of your magazine.

Second—I want to criticize the stories in the April number. "The Evening Star" was the best story since "The Human Termites! "The Infinite Brain" was wonderful. More by Mr. Campbell please. The rest were so, so.

Third—the request for reprints. I am one of the unfortunates who did not read "The Moon Pool." I notice that you say you have no room for reprints. Did it ever occur to you to add a few more pages to the magazine exclusively for reprints? If you won't reprint this story, publish this letter in "The Reader Speaks." Is there any person who would be willing to sell me "The Moon Pool?"

Please have more illustrations by Paul and more interplanetary stories.

Julius Schwartz,
407 East 183 Street,
New York, New York.

(The deletion of the word science was merely an effort to extend the scope of science fiction to the people who had never heard of it—and who were frightened by the word "Science." Unfortunately the word has come to be associated with technical publications, and not with fiction magazines.

However, we are sure that the result of the change will be beneficial to all. Our readers will find that they will become part of a greater circle of fans and science fiction will truly sweep the country as it never has before.—*Editor.*)

On Adventure

Editor, WONDER STORIES:

I like the new name of your magazine—WONDER STORIES, and I sincerely hope the magazine will live up to the standards of this name, and give us some good stories without science. If you will notice carefully, as I believe you have been doing, when you've omitted the word "science," you will find that the stories published in your magazines that were liked by all were not packed with descriptions and explanations. They were full of adventure.

Only those who study science want the explanation and detail. And I notice from "The Reader Speaks" that they are the ones that write to your magazine, which may lead you to think that they have the same opinion as the public. I have taken it upon myself to tell you what we really want, but I guess I'm a little too late, and that you've already found out. So come on, Mr. Wells and Mr. Keller, and the other authors, and keep up your good stories, but leave out, at least, some of the details you are accustomed to giving.

Regarding the News Department, and the Questions and Answers Section—I like them, but please make them shorter. A page for each department is plenty of space. "The Reader Speaks" and the "Book Reviews" Departments are wonderful. I also wish to compliment you on the new type of print. I am glad to say that every month there is an improvement in this magazine. WONDER STORIES—The Magazine of the People—It certainly is THE Perfect Magazine.

Thomas McDonnell,
1626 Church Avenue,
Scranton, Pennsylvania.

(*Continued on page 87*)

THE READER SPEAKS

(*Continued from page 86*)

(Mr. McDonnell's letter brings up an interesting point in connection with our stories. The question is—what is a scientific story and what is a technical story? Obviously a scientific story is one in which a scientific principle is used to cause action, suspense, adventure, etc among characters. A technical story on the other hand is one that deals with the details of the scientific principle and the author of such a story describes in detail each motor and generator, what their voltage is, how they are wound; the types of transformers and boilers, etc. He therefore leaves absolutely nothing to the imagination of the reader and in fact credits the reader with no intelligence whatever! That is the type of story we are trying to avoid. We are trying to keep up the same high standard of scientific plausibility and truth and yet avoid the technical details that overburden a story so that the reader's patience is exhausted.

Speaking of adventure there are two kinds. There is the mere blood and thunder cowboy-Indian and the cattle rustlin' type; and then there is the adventure that is not only clean and wholesome but also stimulating and refreshing. President Roosevelt said that he read Craig Kennedy detective stories by Arthur B. Reeve—*Editorial Commissioner of Amazing Detective Tales*—because they not only rested but stimulated him. For the same reason men and women in all walks of life read adventure stories. They are not to be despised, and we will continue to print the best adventure stories based on science—which is really science fiction—that we can get.—*Editor.*)

The Popularity of Authors

Editor, WONDER STORIES

In the May issue of our magazine in answer to my letter you state that BLACK is a total absence of color, and that black IS the color of outer space. Allowing, for the sake of argument, that black IS the total absence of color, I still maintain that there IS COLOR IN SPACE OTHER THAN BLACK. The Dept. of Science, U. of I. in this town has seen the waves of gravity! Knowing that only color can be seen and that space contains gravity, therefore outer space cannot be black. Since black is *total* absence of color, and there is gravity in space, space must have some color, even though not visible to the naked eye. Also what about the quntyfyleele (you spelled quntyfyleele wrong in your last issue) of space?

In Urbana there are ninety-two people who take WONDER STORIES regularly. We have formed a club named the "Science-made-a-pleasure" club. Last week we voted on the most popular authors who write for our magazines. They are: Keller, 69 votes; Vincent, 14 votes; Repp, 3 votes; Kline Bros., 3 votes.

All the members of the club join me in petitioning that the continued stories may be stopped. We suggest putting them in one issue and put the shorter stories whose place they fill in the next issue.

Why not put out a set of books containing the best stories you have had in your magazine to date. Stories like the "Human Termites," the "Conquerors," "Evening Star," "Alien Intelligence" deserve this.

Charles B. Busey,
604 West Green St.,
University of Illinois,
Urbana, Illinois.

(We were more than pleased to be the results of this popularity contest. What do our readers think about our authors? It Dr. Keller the universal favorite or have other groups or other individuals their own "favorites." We invite their comment.

The question of serials has received much discussion. From all the evidence we now have, serials are desired by the majority of readers. However, whenever we can see that the majority do not desire them, we will be glad to change in accordance with their wishes. What do you think?—*Editor.*)

Are We Safe from Interplanetary Attack?

Editor, WONDER STORIES:

I have just completed reading the April issue of AMZ WONDER STORIES. All of the stories were very good, but that is just repetition, for one can say that about any of the issues, not

(*Continued on page 88*)

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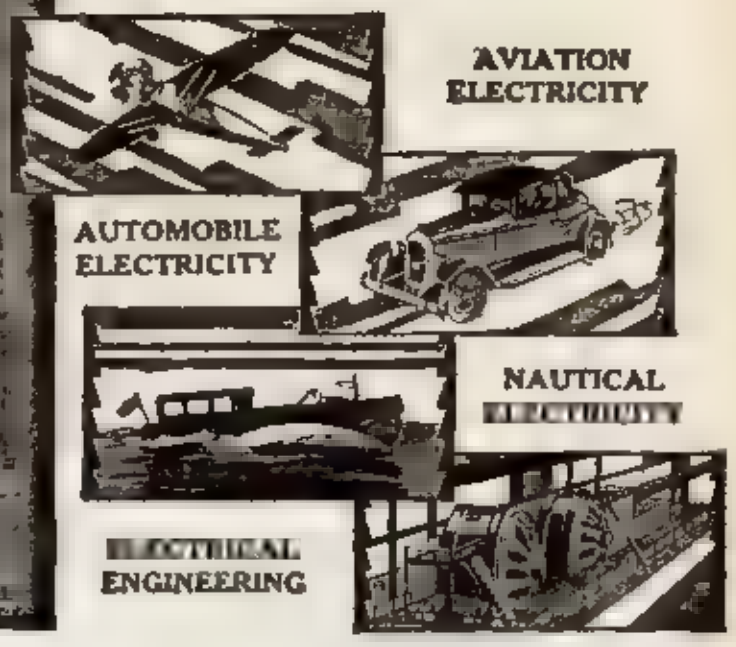

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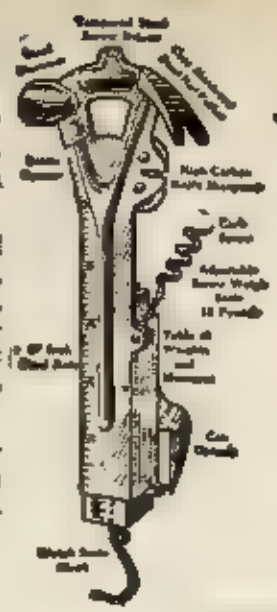

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THE READER SPEAKS

(*Continued from page 87*)

only for AIR WONDER STORIES, but for SCIENCE WONDER STORIES also.

In my opinion "The Flying Legion," which was concluded in this issue, was a story of the highest type. As a matter of fact, all the serials which you have published in AIR WONDER STORIES have been exceptionally good. I hope you continue having them so. In the editorial comment on "The Flying Legion" you ask your readers' opinion as to whether the Master was justified in "violating" religious relics for the sake of adventure. In my opinion he was. That is of course looking at it from the viewpoint of the Master and not of the Mohammedans (in this case).

My vote in the serial question goes for more serials. I don't mean more in each issue (one at a time is enough), but I think you should continue to use them. As to the type of stories: I am very fond of interplanetary stories; don't be afraid to print plenty of them. After all the question of interplanetary traveling is an increasingly important one. I do not know what will give the public more knowledge on the subject than the stories you print and the questions about them brought up in the readers' departments. If the other planets in this solar system are inhabited, and I think it is entirely possible, we should certainly find out all about it, if only as a matter of protection.

JACK P. SICKELS,
Lapwai, Idaho.

(Our correspondent looks a long way ahead when he hints at the necessity for protecting ourselves from possible attack by inhabitants of other planets. Yet, if any planet in the solar system, or even in another system, is inhabited, it is not beyond possibility that the inhabitants of that planet have already developed interplanetary communication and are operating space-ships. The earth is by no means the oldest planet on which life can exist, and we know well that the human race has not traveled very far along the evolutionary road to a high plane of mental development. Now suppose a planet exists on which space-ships are as common as automobiles are here, and that one of these ships sets out on a tour of exploration, somewhat as Rear-Admiral Byrd has explored the South Pole, and this space ship arrives on the earth—what would we do? If the newcomers were equipped with extraordinary weapons, and were inimical to us—what COULD we do? Suggestions from our readers are welcome and will be published in these columns.—*Editor.*)

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A Letter from England

Editor, WONDER STORIES:

I wonder if you would like to send me the 12 books of the New Science Fiction Series? I have seen the advertisement in AIR WONDER STORIES and I am awfully keen to get them.

Now may I say just how much my wife and I appreciate AIR WONDER STORIES. Unfortunately we have no such magazines in this country so you may guess how much your books (SCIENCE WONDER STORIES, included) are sought for. They are rather hard to get, but we don't miss many numbers. We were uncertain as to whether you would send your new magazines so far from America, but it was a relief to find that we can still get the new Wonder books.

If you could do so, please let me know, and I will post you the subscription fee at once. (Is a dollar five shillings, by the way?)

LEONARD A. KIPPIN,
55 Ilenfld Drive,
Ilford, Essex, England.

(Though our circulation manager has answered Mr. Kippin's letter personally, we reprint this communication in order to inform our British readers in general as to where they can obtain copies of our magazines in England. Those who have any trouble securing copies should communicate with Messageries Hachette, 3 La Belle Sauvage, Ludgate Hill, London, E.C.4, England. A dollar, in English money, is four shillings and two pence. The rate of exchange varies slightly from time to time, but usually this normal rate prevails. Generally speaking, one can compare an English pound to the American five dollar bill, in purchasing power.

English readers are advised that the newest of our magazines, AMAZING DETECTIVE TALES, is now on its way to European distribution.—*Editor.*)

SCIENCE NEWS OF THE MONTH

ELECTRON BULLETS KILL GERMS

Electronic bullets, fired with electricity as low as thirty volts, which can be obtained from a battery of twenty dry cells, are capable of killing at least one common form of germ. In a study made at the University of Cincinnati, Dr. D. A. Wells has found that *Staphylococcus albus*, the mildest of several germs that produce boils, is destroyed by these relatively low speed electrons, moving at speeds of a few miles a second. High-speed electrons, driven by voltages of several thousand, have already been observed to have a germ-killing effect. Modern theories suggest that electrons are similar to forms of radiation like the ultra-violet rays, which also kill germs. The germs must be rayed in a vacuum tube; but those used in the experiment could be kept for eight hours in a vacuum one fifteen-millionth the density of ordinary air without killing them. When bombarded with electrons of 30 volts energy they were quickly killed, but with lower voltages they survived. The more energy in the electrons, the more germs were killed.

AUTOMATIC RECORDER WILL TRACE VARIATIONS

Tracing a continuous record of the intensity of radio broadcast signals, a new instrument will soon be in use to aid the work of studying the relation between sunspots and radio. The instrument is called a "single-point recorder," and was designed by Dr. Greenleaf W. Pickard. The recorder operates upon the principle of the Wheatstone bridge, used to measure electrical resistance, by balancing the resistance to be tested against one that is known. In the single-point recorder, the vacuum tube in the last audio stage of the receiver is placed in the position of the unknown resistance. When the incoming carrier wave changes its resistance, and upsets the electrical balance, a galvanometer needle moves slightly and turns on a motor. The motor adjusts the apparatus until all is balanced again. In doing so, the motor moves the pen which writes the intensity record on a moving sheet of paper.

ROTATION OF GALAXY EXPLAINS STAR MOTIONS

Rotation of the Galaxy—the system of stars of which the sun, the Milky Way and all the visible stars are part—around a distant and massive center, helps explain the peculiar motions of the bluish-white stars classified by astronomers as type B. This announcement was made by Dr. J. S. Plaskett, director of the Dominion Astrophysical Observatory, at Victoria, B. C. Dr. Plaskett explained that the stars of type B (which are so classified by the lines that appear in their spectra when their light is analyzed) are all moving from or towards the sun with much smaller speed than any other spectral type. But the curious fact has been found that most are moving from the sun; as if the whole system of these stars were expanding around the sun as a center. The average speed away from us is about five kilometers (3.1 miles) per second.

Though various suggestions have been made to account for this anomaly, such as errors of measurement, Dr. Plaskett has found that most of them agree with what would be caused by a rotation of the whole stellar system.

SUN'S CORONA PARTLY IN ATMOSPHERE, SAYS ASTRONOMER

A startling suggestion that the sun's corona, seen as bright wings around it at the time of an eclipse, may originate partly in the atmosphere of the earth is made by Dr. Harlan T. Stetson, director of the Perkins Observatory at Ohio Wesleyan University. The remainder of the light, in fact, most of the corona that we see, he suggested, may actually originate near the sun; but the cloud that causes it, according to his hypothesis, is not narrowly limited, as previously supposed. Instead, it extends throughout the whole solar system and perhaps to the other stars.

The tiny particles in this cloud shine partly by actual reflection of sunlight, and partly by excitation by some of the other rays from the sun. This nebulous cloud may be similar to the cloud of nebulosity that astronomical photographs reveal around the Pleiades

(*Continued on page* 90)

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SCIENCE NEWS OF THE MONTH

(*Continued from page 89*)

DEVISE QUICK METHOD OF ANALYZING COLORS

Two chemists of the University of Pennsylvania have invented an automatic apparatus with which the colors of transparent and opaque objects can be analyzed with scientific accuracy, in less than ten seconds. The new analyzer is portable, and can be operated by a connection with an ordinary light-socket. The sample to be tested is placed over a small rectangular opening on top of the box containing the apparatus. There it is illuminated by a powerful light. The light, reflected perpendicularly from the sample, is admitted to a spectroscope in which it is separated into its component colors. A selected portion of the dispersed light is then allowed to pass into a photoelectric cell, and the very feeble current passed by this cell as a result of the light falling upon it is amplified about a million times. The amplified current, which can be read on a sensitive galvanometer, is recorded on a photographic film.

By turning a small crank, different portions of the spectrum are successively admitted to the photoelectric cell until the entire spectrum has been covered, while the photographic film is moved through a corresponding distance. Coordinate lines and an identification number are printed on the film in a separate compartment of the machine. The entire operation of analyzing a color is thus made automatic, and a complete record of a colored sample can be obtained in less than ten seconds.

PLAN "FLYING HOTELS"

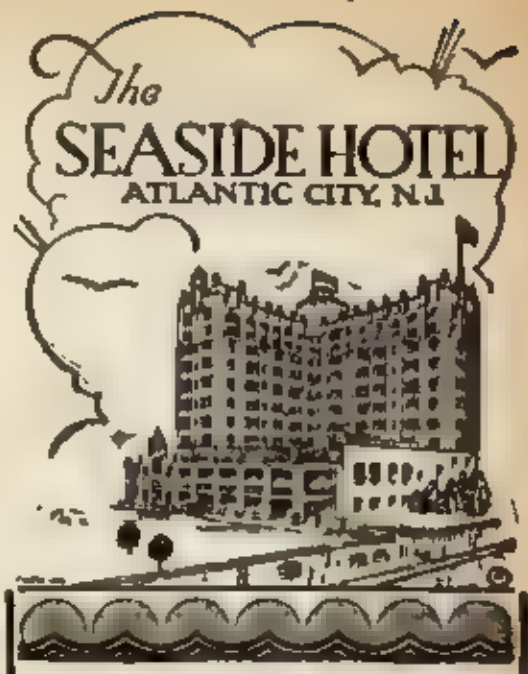
John E. Lodge, writing in *Popular Science Monthly* for February, 1930, describes the latest project in aviation development—gigantic eight-motored planes to carry 160 passengers and crew in their hollow wings. The planes are to be built by a Connecticut firm, and are to be used for transcontinental flights. The planes, with wing spreads of 262 feet, would be twice the size of any ever built before.

The hollow wings, measuring nine feet from top to bottom at the thickest part, will contain the passenger cabins and the dining salon. Two double-deck, fuselage-shaped outriggers will contain the engines and quarters for a crew of seventeen, with room to spare for two passenger salons. Each salon will seat 42 persons, and the remainder of the passengers will be accommodated in cabins along the leading edge of the hollow wing. Cabin seats will be convertible into cabin berths. The plane itself will weigh 72 tons, and will be driven by eight engines developing 8,000 horsepower. These will be arranged so that banks of four engines each will operate two 34-foot low-speed propellers. An arrangement will permit any motor to be "cut in" independently of the others. For cruising speed six of the engines will be used, while two engines will serve to keep the machine aloft. There will be an engine arrangement in each of the two fuselages; consequently the plane will have two tail arrangements, and these will be connected.

SUNSHINE VITAMIN DRAWS ATTENTION FROM OTHERS

Prof. H. H. Sheldon, writing in the *New York Herald Tribune*, has discussed the advantages and disadvantages of all the interest focussed upon the "sunshine vitamin" Vitamin D. The great disadvantage, of course, is that it detracts attention from the other vitamins. There are five other vitamins which are equally important to good health, and these, unfortunately, have received far less attention than D. Yet they are equally necessary, and they have a great deal to do with growth, with the resistance of the body to bacterial invasion, with the resistance of the nerves to nerve ailments, and so forth. Curiously enough, we know very little of the nature of vitamins beyond knowing what they do, and where they are to be found. They may be simply configurations of molecules, and they may be arrangements of the parts inside the molecules themselves. The fact that the sunlight vitamin is produced by irradiation with ultra-violet light suggests the latter hypothesis, in this case at least.

(*Continued on page 91*)



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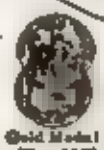

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SCIENCE NEWS OF THE MONTH

(*Continued from page 90*)

POISONED BLOOD REPLACED BY FRESH

Victims of carbon monoxide poisoning have been saved by the replacing of their poisoned blood with fresh, vital fluid from another, unpoisoned individual. Carbon monoxide gas, the deadly and odorless element in automobile exhausts and other combustion products, kills its victims largely by poisoning the red corpuscles of their blood, so that these tiny oxygen carriers refuse their duty of distributing oxygen throughout the body.

HEART OPERATES X-RAY DEVICE

The human heart has been made its own photographer; with the result that the X-Ray studies of the heart and lungs, which are always in motion, will be improved. The device, invented by Charles E. Weyl, of the University of Pennsylvania, operates by an elaborate system of electrical connections, percussion instruments, mirrors, fans, and electric lights.

The "pulse relay," as it is called, has a rubber bulb cut diagonally across and left open. This is then pressed against the carotid artery in the throat, in such a way as to make the pulse beat like a finger squeezing air through the rubber tube, which runs to the relay box and electrical amplifier. At every pulse beat there are made electrical contacts which refract light on mirrors, which in turn set off a train of electrical apparatus that results in exposure of the X-ray plates to the radiated heart and lungs at regular intervals.

OZONE BLANKET KEEPS UPPER ATMOSPHERE WARM

Just as one may sleep warmly out of doors under a quilt, or shiver under a sheet, so the upper atmosphere (what scientists call the *stratosphere*) is kept warm over arctic latitudes by a thicker layer of ozone. This is the explanation given by Dr. W. J. Humphreys, of the U. S. Weather Bureau. The stratosphere is the layer of the atmosphere above the highest clouds, and, unlike the lower layers, does not become colder with height. Temperature observations have been made of this layer by means of small balloons, equipped with recording thermometers. They reveal the curious fact, said Dr. Humphreys, "that the stratosphere is coldest over equatorial regions and becomes gradually warmer with increase of latitude, the extreme difference being around 35 degrees Fahrenheit—coldest over the warmest earth and warmest over the coldest earth." Though a full explanation has not yet been made, Dr. Humphreys thinks that it is due to the ozone. Observations have shown that there is less ozone over equatorial than over arctic regions, a fact that is itself yet unexplained. But the ozone absorbs radiation from the earth, and reradiates part of it back again. Therefore, where there is more ozone, more heat is sent back, and so the upper atmosphere there is warmest.

NEW SERUM FIGHTS INFANT PARALYSIS

The Health Department of New York City has produced an anti-serum for infantile paralysis. This serum, produced in horses, is more potent than the only present remedy, human serum. For some time science has endeavored to discover a practically sure cure for this malady, which kills thousands of infants annually, and the development of the new serum is seen as a great stride in the direction of immunity. Thus far, the serum has been effective only after the disease has been contracted, but it is hoped that it may be developed into a vaccine which will be used as a preventive measure, as in smallpox vaccinations.

INDIAN RELICS OF 1000 B.C. FOUND

Anthropologists of the University of California have found in a cave of the Humboldt Mountains of Nevada, relics of an Indian tribe, which date back three thousand years. The tribe has been identified as that of the Saidukas who are said to have been red-headed, cannibalistic and fearless. They were exterminated in a three year war by the Plutes, a rival tribe who now occupy the territory surrounding the cave. Many objects found in the cave show the existence of a rich culture among the Saidukas, the development particularly, at that early date, of baskets and many wooden implements. (*Continued on page 92*)

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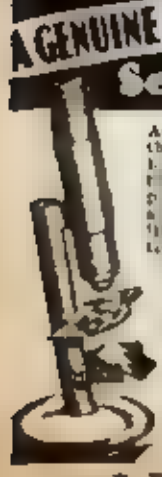

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SCIENCE NEWS OF THE MONTH

(*Continued from page 91*)

DISCOUNTS EFFECTS OF REJUVENATION

A number of eminent Austrian physicians have completed a prolonged study of monkey gland rejuvenation, and have come to the conclusion that this treatment is effective in only a relatively small number of cases. Even then it is effective only for short periods. Gland transplantation, as developed by Voronoff, was carried out on a number of poor patients, and only those people were selected who, since they were of advanced age, were likely to show the benefits of the treatment. Only with one of them, a 74-year old man, was lasting improvement attained; yet even this case failed to exhibit a regrowth of hair, disappearance of wrinkles, or other external signs of rejuvenation.

The conclusion drawn is that only ageing, not aged, organisms are capable of rejuvenation.

FEVER GERMS USED TO FIGHT LEPROSY

Leprosy is being fought by the injection of germs of diseases which cause high fevers. These fevers are used to fight the fever of leprosy; and, though chaulmoogra oil is still the only proved cure for the disease, some progress is being made in the fever treatment, according to Dr. Victor G. Heiser, leprologist of the Rockefeller Foundation. Experiments have been made in Siam and in Bengal, India, the fever germs being those of the local diseases, kala-azar. One reason why a new cure must be developed is because there is not enough chaulmoogra oil to treat even a fraction of the victims. Only two out of every 135 lepers receive treatment. The fever treatment of the disease is somewhat similar to the use of malaria organisms to fight paresis.

MAGIC RADIO TUBE WORKS WONDERS

O. H. Caldwell, writing in the *New York Times*, mentions some of the miracles which have been worked by the radio vacuum tube, and says that the future application of these tubes in industry stagger the imagination. The wonders that radio has already worked may be considered of minor importance in comparison with what the use of the vacuum bulb is expected to bring about.

The development of "electronics"—the phenomena and applications of the vacuum tube—will be of incalculable benefit. Already the electron tubes and the photoelectric cells have demonstrated their usefulness in an amazing number of devices—in talking pictures; in telephony; in broadcasting, in oscillators, detectors, amplifiers, and rectifiers. In addition, engineers are developing a new musical system, which will be the result of the electrical oscillations of the vacuum tube. The tones of various instruments will be reproduced, and new beauties of tone added.

In industry, a new technique in apparatus control has been built up. Elevators can be leveled with quick accuracy; industrial operations can be automatically controlled; traffic signals are operated automatically; all sorts of factory and agricultural products are being counted and graded automatically. A new science of measuring and metering is being developed, and infinitesimal distances and changes in temperature can be noted.

LOCATE WINDIEST PLACE ON EARTH

The windiest place on earth has been reported to be Commonwealth Bay, on the coast of the Antarctic continent south of Australia, several hundred miles west of Admiral Byrd's present station at Little America. This has been determined by an examination of the records of Sir Douglas Mawson, who explored the place ten years ago. For the entire twenty-two months while his expedition occupied the locality, the wind averaged forty-four miles an hour, enough to be considered a gale in other parts of the world. Wind speeds of 100 miles an hour were quite frequent, and at times no record could be obtained because the wind recorders were blown away by the terrific blasts. There was never any cessation of the wind since. If it did die down in camp for a moment, it could be heard roaring over the higher land near the station. In the highest winds, it was impossible to move except by crawling, or by leaning at a perilous angle toward the wind in walking.

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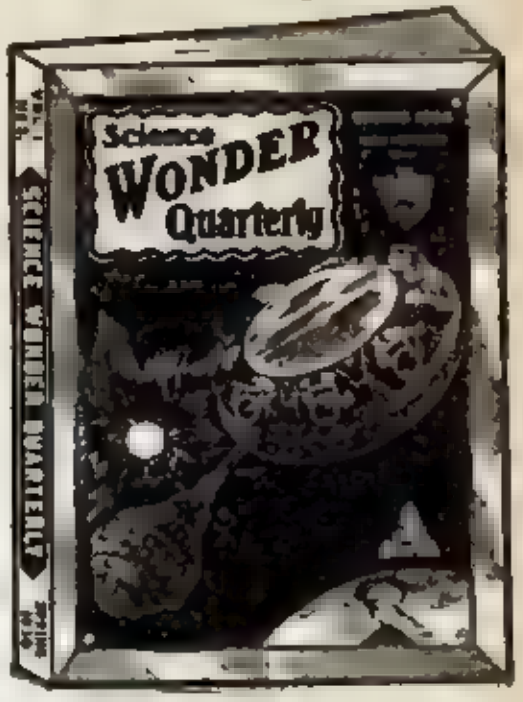

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BOOK REVIEWS

EXPERIMENTAL SCIENCE, by A. Frederick Collins. 280 pages, illustrated, stiff cloth covers, size 7½" by 5". Published by D. Appleton & Company, New York. Price, $2.00.

Mr. Collins has published a long series of books on general and practical science, and *Experimental Science* is one of the most fascinating of them all. He presents a great number of curious experiments which anyone can perform, since most of them call for only the simplest apparatus. The volume treats of the behavior of air, gas, water, magnets, high-frequency currents and radio, the workings of simple machines, the effects of gravity, gyroscopic motion, light and color, heat and cold, and other basic facts of physical science. While it presents its information in a way which arouses interest and gives pleasure, it instills, at the same time, a sure knowledge of the bases of physics. We can recommend this book without reservation to all those who wish to gain a better knowledge of science through practical experiment, and not through mere theory.

SCIENCE AND THOUGHT IN THE FIFTEENTH CENTURY, by Lynn Thorndike. 387 pages, illustrated, stiff cloth covers, size 9¼" by 6". Published by the Columbia University Press, New York. Price, $4.75.

This book contains several studies in the history of medicine and surgery, natural and mathematical science, and philosophy and politics. Written by Professor Thorndike, a member of the history department of Columbia University, it represents the results of years of research, and gives a new picture of the 15th century by the use of unpublished manuscript materials, by new analysis and criticism of previous estimates, and by a varied method of approach from the different avenues of scholasticism and humanism, science and philosophy. The volume is authoritative, is fully documented, and clears up doubts concerning a very vital period in human history—the Renaissance. Those interested in the history of scientific development will welcome this scholarly volume.

SKY TRAVEL, by A. Ralph Romer and Margaret Romer. 302 pages, size 7½ by 5½ inches, stiff cloth covers. Profusely illustrated with photographs. Published by Rand McNally and Company, New York and Chicago. Price, $1.48.

An exceptionally well illustrated book for children, written by two professional elementary school teachers. The purpose of the book is twofold: first, to present the principles of aerodynamics in such simple and non-technical terms that the average school child can understand them; second, to relate briefly the fascinating story of man's struggle to conquer the air.

The material has been presented in the form of a narrative relating the adventures of a boy and girl who partake in many adventures in the air. On nearly every second page, the text is illustrated by well-taken photographs, which help the child to visualize the aviation industry and its future. Parents who buy this book for their children will find that *Sky Travel* contains much of interest to adults as well as those to whom the book is primarily directed.

NATURE NARRATIVES, by Austin H. Clark. 135 pages, stiff cloth covers, size 5" by 7½". Published by the Williams & Wilkins Company, Baltimore, Maryland. Price, $1.00.

This fascinating book, the first of a series, is written by an associate of the U. S. National Museum. It presents facts far stranger than fiction concerning various curious animals, fishes, and amphibians. The animals and plants discussed in the fifty little sections, range from the Australian spiny ant-eater to the goose-fish, and from the sea-horses and white sharks to sea serpents and *stegosaurs* (armored dinosaurs of prehistoric days). All of these accounts are informative, and all are intensely interesting. The charm of the book lies in its variety, in the absence of technical language, and in the intimate informality of its style. One can imagine the author telling his stories verbally—which is a great merit in a book dealing with strange forms of life.

(*Continued on page 94*)

Over the Mountains from Los Angeles 559 Miles on 11 Gallons of GAS

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THE STARS, HOW AND WHERE THEY INFLUENCE, by L. Edward Johndro. 120 pages, illustrated, stiff cloth covers, size 6" by 8¾". Published by the Doherty Publishing Company, San Bernardino, California. Price, $1.00.

In this book the author attempts to correlate mundane happenings with celestial conditions that accompany them. Such attempts lie, strictly speaking, in the field of astrology, rather than in that of astronomy; but the author presents in his book a wealth of scientific and astronomical information which makes it interesting as an attempt to tie together celestial movements with happenings on our own little earth.

Statement of the Ownership, Management, Circulation, etc., Required by the Act of Congress of August 24, 1912,

Of WONDER STORIES, published monthly at 404 Wesley Avenue, Mount Morris, Illinois, for April 1930.

State of New York
County of New York
ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Irving S. Manheimer, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the WONDER STORIES and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Stellar Publishing Corporation, 404 North Wesley Ave., Mt. Morris, Ill.
Editor, Hugo Gernsback, 98 Park Place, New York City.
Managing Editor, David Lasser, 98 Park Place, New York City.
Business Manager, Irving S. Manheimer, 98 Park Place, New York City.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Stellar Publishing Corporation, 404 North Wesley Avenue, Mt. Morris, Ill.
Hugo Gernsback, 98 Park Place, New York City
Sidney Gernsback, 98 Park Place, New York City
D. Manheimer, 98 Park Place, New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of the total amount of bonds, mortgages or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

IRVING S. MANHEIMER

Sworn to and subscribed before me this 1st day of April, 1930.

ROZELLA BENNETT, Notary Public.
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(My commission expires March 30, 1931.)

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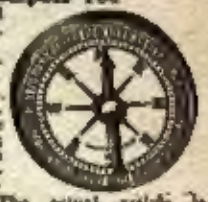

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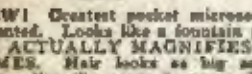

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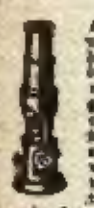

A REAL laboratory microscope that stands 9" high, comes complete with forceps, 2 prepared specimen slides and 2 blank glass slides, all packed in a cherry wood box with brass hinges and fittings. Made entirely of lacquered brass, with powerful lenses. Entirely demountable to facilitate cleaning. Has arcade (open both sides) frame and rotary reflecting mirror. Made in three models for use in home, office, or laboratory.

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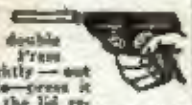

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A full deck of 52 linen finish cards that you can use for play or magic. Deck is cut tapered, one end narrower than the other. Draw away card picked from the deck—and hundred of other amazing feats. Full instructions for performing 10 different tricks. Startle and entertain your friends. No skill required.

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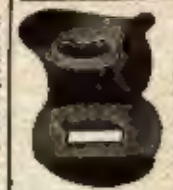

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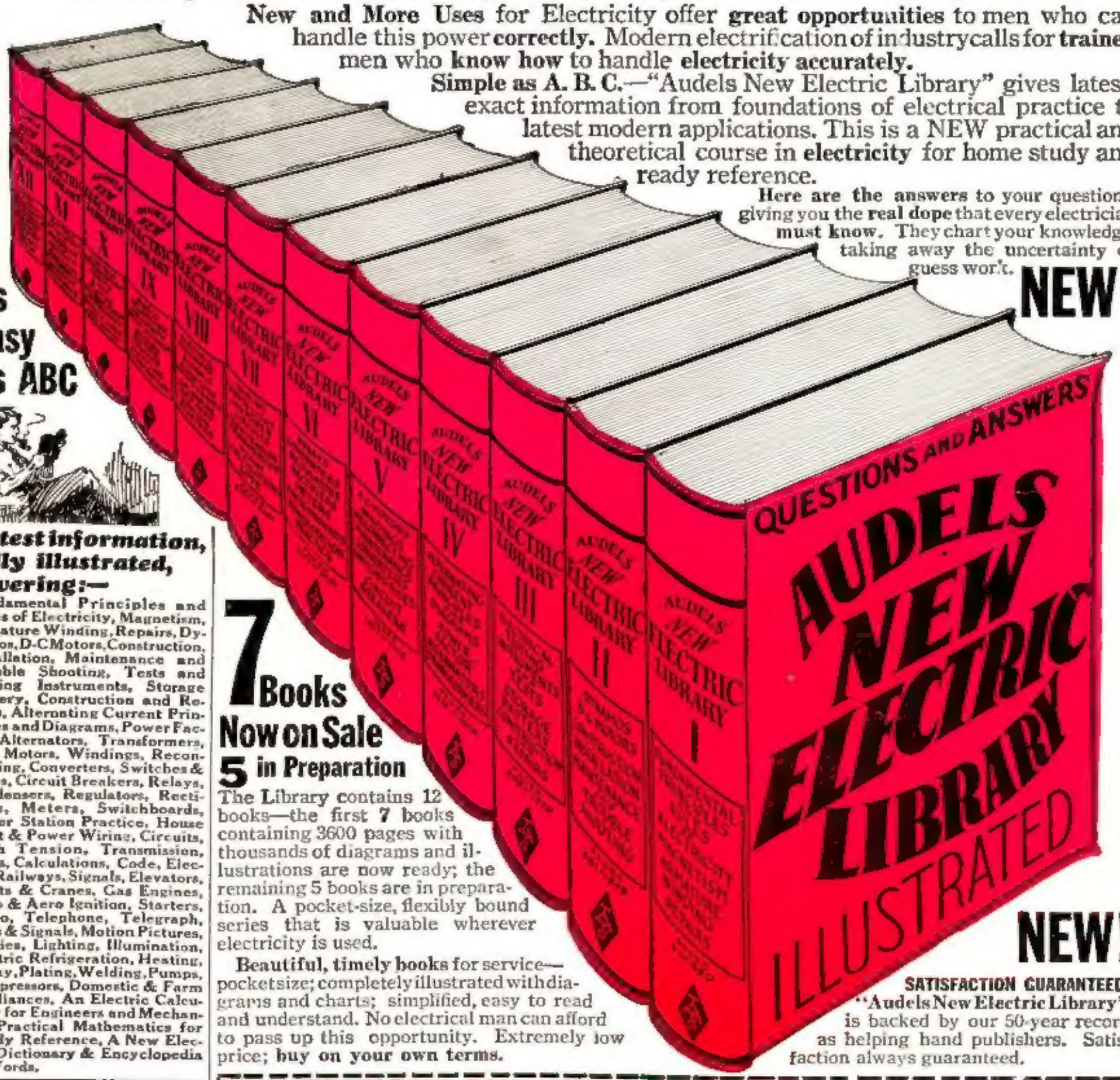

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